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SECOND HONORABLE MENTION.

THE NAVAL PROFESSION.

Motto: "Keep up with the Times."

By COMMANDER BRADLEY A. FISKE, U. S. Navy.

Everybody is born into a world in which he must have considerable unhappiness, but in which he may get a great deal of happiness. The principal factors that go to assure happiness may, in the order of their importance, be stated as follows:

1. Good air to breathe.
2. Good water to drink.
3. Good food to eat.
4. Good clothing to wear.
5. Good employment.
6. Good companionship.
7. Good chance for self development.

These seem to be, not only the natural desires, but the natural rights of every man. But what can he claim as a right besides? He brought nothing into this world, and it is sure that he can take nothing out. At first sight, it would seem that these things ought not to be hard to get; but it is a matter of common knowledge that few people get all of them.

The great governments of the world assure all of them to every man in the naval profession, provided he is sober and obedient. In the matter of self development, it is doubtful if any other vocation gives a man such excellent opportunities. The demands made on every man for courage, intelligence, unselfishness, and endurance are not excessive, but are greater than like demands made by any other profession; and are sufficient to develop these qualities to a high degree in any man who wills it. And the travel, and the intimate mingling with many kinds of men, and the almost infinite variety of experience ashore and afloat, in storm and in calm, in peace and in war, under the glow of tropical sun, and in the ice of the Arctic Sea, give a man an experience and a wealth of memories, in comparison with which the experience and the memories of a man in any other profession are commonplace and tame.

But the men of the naval profession are not given these advantages for no reason. They are given them by every government in order that that government may have at its call the most powerful weapon in the world—a modern navy. Now that navy must fulfill certain requirements.

Since the naval profession, during the last fifty years, has endured a succession of changes so great as to bewilder the understanding, greater than any other profession has endured, it may be well to try, even feebly, to see what its requirements are; and because the requirements of one period may not be the same as those of other periods, and yet may be supposed to be so, it may be profitable to begin at the beginning, and, recognizing the naval profession as one branch of the military profession, the profession of waging warfare, try to see what conditions it must meet, and what its members ought to know and do. And as the naval profession exists only to wage naval warfare, and as naval warfare is only a branch of warfare in general, it may be well to think a little about warfare in general.

WARFARE.

It has been said by the wise that love and war are the normal occupations of mankind. During the earlier ages, when the conditions of living were crude, man fought with man, and man fought with beast, in the struggle for existence. Every man's hand was against every man, and war in its crudest form was

his principal employment. Later, the advantage of organization was seen, by which two men acting with mutual support could overcome one man, three men could overcome two men, etc. Family and tribal organizations resulted. By this means, war, instead of being continual, became intermittent; and intervals of peace resulted, in which time was found to practice other arts. That time was found to practice the art of love there is reason to suspect; that the art of trade was invented, and that it found many devotees, we have good reason for believing.

Ever since, the arts of love and trade and war have been the controlling factors in guiding the destinies of men. Love has been the agent by which the perpetuity of the race has been assured; trade has made possible the wealth which has enhanced so much the comfort and refinement of the nations which have followed it; while war, and the danger of war, have been the principal agents whereby men have learned to join in concentrated action. And the strong governments, made possible in every case by the results of some war, have been the practical means whereby the vicious have been kept down, life and property protected, and large communities enabled to live together.

It is not necessary in this paper to consider which of these three factors has been the most potent; neither is it necessary to consider what their relative potencies might have been, if the actual nature of man had been different, interesting as such investigations would doubtless prove; for a mere statement of the parts they have played is enough to arouse the attention of the dullest mind. The part played by love has doubtless been the most alluring, if one judges by the number of people who have been engaged in it, and by the number of books there are concerning it. There have been a number of persons concerned in trade also; and we may reasonably suppose that it has interested them to a great degree. But the grand crises of the world; the extremes of triumph and disaster; the acme of the picturesque, the exciting, and dramatic; the pinnacles of human glory, have been reached only in war.

The Evil of War.—Yet that war is, next to disease and sin, the greatest evil in the world, can hardly be denied. War has been the immediate cause of an amount of suffering, and an acuteness of suffering, so frightful as to appall the imagination and wring the heart. From even the earliest times, and even in barbarous

countries, the evils of war have been deplored, and ways sought to prevent it. Yet at the present day, in spite of the almost unanimous feeling of all the people in the world, in spite of the prevalence of Christianity in all the powerful countries, in spite of war's terrific expense, nations seem shoved into war by some irresistible force. War seems as unpreventable as death. The United States and Spain, Great Britain and the Boers, Japan and Russia seemed carried into war by forces outside of themselves. Not one of those six countries could possibly have abstained from war. Why?

War is an Effect, as well as a Cause.—Because war, while a cause of many effects, is itself an effect of many causes. It is an effect of those causes, just as inevitably as any disease is an effect of the causes which produced it.

Noting this, we can see how foolish are the railers against war, and how much more foolish are the railers against the men who fight in war. War does not come about through its own act, or through the acts of the soldiers and sailors who fight in it. Sometimes the underlying causes of a war are hard to find; and very rarely is the apparent cause any more than the upsetting, and often by a trivial incident, of an equilibrium that long had been unstable. Clearly, the real cause of any war is not the final trivial incident; the real cause is whatever cause, or causes, made the equilibrium unstable.

Causes of War.—Now, what causes make the equilibrium of good feeling between two countries unstable? Is the presence of a standing army or navy on each side a cause? Do these armies and navies insult each other; and then does each army and navy tell their country of the insults which some other army and navy have been heaping on them, so that each country gets very angry with the other country? Are the officers and men who will have to fight in a war, and get killed, and wounded, and sick, and leave their families in destitution—are they the ones who bring on war?

Leaving out as not pertinent to the present paper, the causes of wars between ancient countries, and between barbarous peoples, what is the thing most apt now to disturb the equilibrium of good feeling between two countries? Is it not the same thing that is most apt to disturb the equilibrium of good feeling between two men? Is it not the competition for money, or its equivalent?

Under any stable government, the competition for money can be regulated within that country, and the money gained by any man can be protected for his use; in fact, the government of any country exists primarily for the protection of the lives and property of its people. It accomplishes this by means of legislatures, courts and police. No matter how excellent were the legislatures and courts, no man could keep five dollars five minutes, unless the legislatures and courts were supported by a competent police.

Non-Preventability of War.—It is doubtful if many people would deny this; and yet, if they do not deny it, they admit that there are so many bad people, or so many people of conflicting views, in the world, that force must be exerted to protect a man in his rights, or what he thinks his rights. Now, if the exertion of force is needed to protect a man in his rights, how can the exertion of force be avoided to protect a country in her rights? And what is war but the exertion of force on a large scale?

Vocation of Warrior is Honorable.—Furthermore, if we recognize war as an evil which we have not yet learned to prevent, and if we recognize the exertion of force as the only means of making war, we seem forced to the conclusion that there is no virtue in exerting the force ineffectively. In fact, it seems sure that, if we must exert force, we ought to do it as effectively as possible, in order to lessen the period of time during which we must exert it; that, if we are to police a city, or wage war, the police force in one case, and the army and navy in the other case, should be as effective as possible; and that their usefulness will be proportional to their effectiveness. Therefore, it is useful to have a police force and an army and navy as highly trained as possible. If this be true, it follows that the vocation of a member of a regular police force, or of a regular army, or a regular navy, is useful, and therefore honorable.

Mr. Carnegie's Rectorial Address.—Unless the above reasoning is entirely illogical, Mr. Carnegie's rectorial address before St. Andrews college was entirely illogical. This address, while an able plea for arbitration, not only assumed (entirely unnecessarily for his argument) that regular armies and navies are foes to arbitration, which they are not, but directly charged their members with devoting their lives to evil for the sake of money. He commended fighting to protect one's country, provided the fighting were done by volunteers; but he did not seem to realize that

fighting by volunteers is war, just as actually as fighting by regulars is; much more apt to be horrible, and almost sure to be useless, if regulars be on the other side.

Mr. Carnegie's address was an insult to every officer and every man in every regular army and navy. It came from a very influential man, and represents the view of an extreme section of a powerful faction; therefore it justifies one in pointing out that, if a man disgraces himself by devoting his life to an army or navy for a small salary, while incidentally exposing himself to the dangers of war, he disgraces himself equally by selling war material for armies and navies to use, at large profit to himself, and without exposing himself to the dangers of war.

Preparation for War.—Supposing that war, at the present time, is unpreventable, we can see that it is our duty, as officers, to try to learn to wage it. The writer would like to be able to say some interesting and instructive things about it; but the trouble is that war has occupied the attention of the world so long and so vividly, that it is almost impossible even to think new thoughts about it; and so much has been written about it by all kinds of writers, that it is also probably absolutely impossible to say new things about it. Nevertheless, there are one or two facts concerning it which do not seem to have attracted the attention they deserve.

One fact is the comparatively recent date at which warfare took on what may be called the *preparation phase*. This does not mean that wars have not always been prepared for, in a way; but it does mean that the importance of careful preparation has only recently been appreciated at its proper value. In the Franco-German war, warfare took on a phase entirely new; and the incident is clearly marked as the invention of gunpowder or the sextant. As in all great movements, that succeeded in effecting permanent changes, one man initiated the idea, carried out the long process by which the idea was developed, and finally presided at the culmination; when the thoughts of genius, and the long years of painful labor against ultra conservatism bore fruit in a triumph which for completeness and importance has few parallels in the history of men. Previous to Von Moltke, no such complete preparation for war had ever been made. Not only is this true in the sense that no such amount of preparation had been made; but also is it true in the sense that no such kind of preparation had ever been made. Never before had twenty years of peace been

spent in fighting theoretical battles. Never before had officers and men been trained in the practical solving of strategical problems by exercises, continued for many years, in sham battles, as distinguished from parades. Never before had subordinate officers been trained to such comprehension of the principles of warfare that they could be trusted to carry out general instructions, and adapt them to conditions suddenly encountered, instead of requiring positive orders, which could not possibly be given with adequate knowledge. Never before had an army of comparatively little experience in war gone into war absolutely trained for war. The change which had been made is illustrated exactly by a comparison between the French and German armies in 1870: for the French army, ill-prepared for the war, as it seems when compared with the German army, represented the amount of preparedness which, up to that time, had been the fashion; and which, compared with that of any army except the German, was extremely good.

Work must be Skillfully Directed.—Another fact to which attention may profitably be directed is the fact that, while Von Moltke initiated and developed the idea of doing hard work in peace as a preparation for war, this hard work was definitely directed. We do not see in any of Von Moltke's plans any intention to do mere *work*, but rather an intention to direct work along profitable lines. In this way Von Moltke performed the highest work that man can do, the directing of the work of many other men by the force of pure mind; not only achieving thereby the object which he tried to achieve, but by that achievement, and by the performance of that useful work, giving employment to the natural activities of the men themselves; for all men find their most enduring happiness in exercising their natural activities in work whose usefulness they see.

Difficulties Confronting Von Moltke.—When one reminds himself of the difficulty with which men are persuaded to adopt new ideas, one becomes convinced that Von Moltke must have gone through years of the most exhausting work, in perfecting his system; the principal work being, not so much the obvious work of preparing the actual plans, as the infinitely more difficult work of persuading other people to believe in those plans, and inciting them to that interest without which their mere work would have been useless. It may be objected that Von Moltke's road

was made easy for him by the fact that Prussia was a kingdom; but this had nothing to do with it, or very little. The government might have been republican, and the same military proficiency have resulted, if the president had supported Von Moltke in his efforts in the way King William did. The authority of a president, while not so autocratic over an entire country as is the authority of a king, is just as autocratic over the army and navy. The condition necessary to Von Moltke's success, in having his ideas adopted and developed, therefore, was not that the sovereign should be a king, but that the sovereign should support him. Knowing, in a measure, the characters of these two extraordinary men, and recognizing the fact that the king had many things to attend to besides the army, we shall probably be right in concluding that a great part of Von Moltke's work,—outside of his obvious work of perfecting his plans,—was in persuading the king to believe in his plans, and then influencing him to give, and always continue, his support.

Influence of the Military Character of a People.—Of course, it is true that the hereditary military character of the German people, and the constant danger of war, made it easier for Von Moltke to secure the interest of the army and the people than it would have been if the conditions had been such as always have prevailed in the United States. And this explains why the United States was so unprepared for war with Spain; and why, to a less degree, Great Britain was so unprepared for the war with the Boers. No other reason can be found to explain why the two wealthiest, if not the greatest, countries in the world should have so disgracefully neglected to take advantage of information as to how to prosecute successful war, which Germany had paid so much time and money to acquire, and which she had given to the world for nothing. A condition like that of Germany, and unlike that of the United States and Great Britain, is to be seen in the preparedness of Japan for war with Russia. Not only do we see the same preparedness, but we see the same causes of that preparedness;—the essentially military spirit of the people, the expected war, the controlling brain of one man—Von Moltke (for it was his ideas that Japan adopted) and the all-powerful support of the sovereign. And not only do we see the same conditions, and the same cause for those conditions, but we also see the same result;—an almost perfect conduct of the war from

start to finish; and an almost uninterrupted series of successes, culminating in such an overwhelming triumph as to astound the world.

Victory Due to Greater Preparedness.—It will be noted that, in these four wars, the two in which one side gained a brilliant victory, were the Franco-German, and the Japanese-Russian; and in both the victor gained victory over an enemy which was supposed by most military people to be at least as powerful; also, that the only assignable reason for the completeness of the victory was the completeness of the preparations of the victor. In the war between Spain and the United States, it cannot be said that victory was won by reason of the preparedness of the United States, for the United States was disgracefully unprepared; but it can be said that it was nevertheless won by the greater approach to preparedness of the United States; for the degree of unpreparedness of Spain is almost incredible. In the war between Great Britain and the Boers, Great Britain was unprepared, though not in the same degree as were the United States and Spain; and she whipped simply because of her excess of power. She would have prevailed very much more quickly and cheaply, if she had been better prepared—and she probably could have prevailed without actually going to war at all.

Use of the Mind in War.—Another interesting fact is the increasing use in warfare of the powers of the human mind. In early days, brute force was the only factor, and rude clubs and missiles the only weapons. As time went on, and organization was invented, the truth was seen that some ways of handling bodies of men were better than other ways; and systems of tactics were devised. Later, it was seen that, not only was it necessary to handle bodies of men when in actual battle with the enemy, but that it was advantageous to lay plans before the battle, whereby the greatest number of men could be gotten to the battlefield, with the greatest speed and certainty; and the elementary principles of strategy were evolved. Later, it was seen that much advantage lay with the side which had the better weapons; but it was not until the invention of gunpowder that this factor became important.

The invention of gunpowder opened a new epoch. This epoch was marked primarily by the longer distances separating the contestants, and by the advantage given to the side possessing gun-

powder over the side not possessing it; but it was marked secondarily by a very much more important matter—the advantage of superior intelligence and education, which began then simply with the differentiation between people intelligent enough to use gunpowder and people not intelligent enough to use it. This differentiation has been increasing ever since; and it has taken on an acceleration during the past fifty years, by reason of the growth of the engineering arts. This applies to both warfare on the land and warfare on the sea; for in both, the improvements in weapons and instruments have been so great that a high grade of intelligence and education is needed, to understand and use them. But it applies to warfare on the sea very much more than to warfare on the land; because the number and complexity of the weapons coming into use is very much greater on the sea than on the land. And it is not merely in the actual handling of the various weapons and instruments themselves that greater intelligence is needed, but in the providing of them; for their number and complexity have increased to such a point that, in the great navies, the most difficult single problem confronting those in high authority is the designing, purchasing, and repairing of the various ships, engines, munitions, guns, and instruments; to which must be added the problem of adopting and adapting new inventions, and taking continual advantage of improvements in the mechanic arts.

Importance of Wealth.—And it is most interesting to note how the invention of gunpowder, and the increasing adaptation to warfare ever since of mechanism of all kinds, has brought about a condition requiring not only more intelligence, but more wealth. In the days before gunpowder, and in the savage nations now, the crude weapons of the warriors are very inexpensive, and the requirements very few. But what shall be said of the enormous cost of the armament of a first-rate power, especially of the navy, a cost increasing year by year, with no sign of abatement, in the mad race that we call progress? And how utterly impossible it is for even the bravest nation, even the nation possessing naturally the most war-like ability, to contend successfully with a nation more wealthy and intelligent! Japan saw this fifty years ago; and set about acquiring modern civilization, in order to resist successfully that aggression from some civilized nation which she foresaw would come.

Principles and Conditions of Warfare.—The truth that it is the use of mechanism which differentiates modern warfare from ancient warfare, has a curious bearing on our accepted creed, which is that the principles of warfare remain the same, and only the conditions change. For the entrance into warfare of mechanism created simply a condition; and yet this condition has given wealthy and civilized nations a greater advantage over others than any skilful adherence to military principles could have given them. This shows that the theoretical study of the principles of warfare must be supplemented by the practical study of the conditions of warfare. As between the two, the study of the principles of warfare is much the easier, and for several good reasons.

One reason is that the principles have been known for so long a time, and are so clearly set forth in books, that the student can learn them as easily as he can learn geometry; while the conditions of warfare are so manifold that it is impossible to set them forth in books; and they change so rapidly that, even if they could be set forth in books, books could not be written fast enough, to keep pace with their changes.

But even if this could be done, the end would not be reached; because the really necessary study of one who wishes to know how to carry on warfare, is, not so much the principles or the conditions as the way in which to apply the principles to the conditions.

As the study of the application of principles to conditions necessarily includes the study of the principles and the conditions, one might presume that practical success would be more dependent on the factor of practical application than on the other two; and such seems to have been the case. As in very few wars we find that any difference in courage and physical strength turned the scale (because men do not differ much in these respects), neither do we find that any difference in understanding the principles of war turned the scale—because these principles have usually been as well understood by one side as by the other; nor do we find that a clearer understanding of the conditions of warfare, or the conditions of a specific war gave victory to one side or the other; because conditions are always of an objective, practical, tangible nature, that are pretty clear to most intelligent men; much clearer to most men than such intellectual abstractions

as principles. The real thing that has turned the scale, seems to have been a skilful application of principles to conditions; a feat which requires a mental capacity which can both grasp abstractions, and apprehend actualities, combined with a skill entirely distinct, that of applying one to the other.

Difficulty of Applying Principles to Changing Conditions.—As between land warfare and naval warfare, there can be little doubt that the difficulty of applying general principles to actual conditions is greater in naval warfare; for the reason that the conditions change more rapidly. Every effect lags behind its cause: no cause produces an instantaneous effect. Therefore, it is impossible that principles can ever be applied to conditions by an unchanging method, unless the conditions are also unchanging. Naturally, if the conditions are few, simple, and slow to change, the effort to keep pace with them is not great, and neither is the lag. But if the conditions are those that now obtain with naval warfare, the lag must be tremendous.

It may be pointed out in illustration that it was only three years ago that any navy began to take proper advantage of the possibilities of modern ordnance; and that we have not yet learned to take advantage of the possibilities of modern mechanism in the handling of fleets. We have not yet learned how to manage modern fleets as well, considering the advantages given by modern appliances, as they handled fleets in Nelson's day. Our ships go faster, and squadrons can be separated and gotten together with greater precision; but this is due, not to greater skill in the admirals, but to better motive power in the ships. The conditions which confronted the admirals and captains of Nelson's day were the same conditions as had confronted their fathers;—the same kinds of ships, guns, masts, sails, and ropes. The result was a skill in handling those loose-jointed fleets, composed of ships that were always leaky, often rotten, nearly always foul-bottomed, whose only propeller was the uncertain wind—a skill that is amazing to the sailor of the present day.

The acquirement of skill was easier then, because the kind of skill required, and the way to attain it, were the same as they had always been, and were perfectly well-known. The conditions were thoroughly understood, and the manner of dealing with them. The reverse is the case to-day.

Waging War Consists of Practical Acts of Applying Principles to Conditions.—Thoughts like these suggest that, while the principles of war, and of all arts and sciences, are the same as they have always been, yet nevertheless, the real difficulty is not in understanding the principles, but to a greater degree in apprehending all the manifold conditions which, in warfare, are changing with a kaleidoscopic perplexingness; and, to a greater degree still, in applying the never changing principles to the ever changing conditions. This statement has probably been true always; but the importance of its being apprehended is becoming greater. Without a clear apprehension of the truth it declares, one is apt to become an extremist; devoting himself too much to a mere theoretical study of the principles of warfare, or to a mere practical observation of the actual conditions. By the mere theoretical study of the principles of war, one can never acquire the ability to deal with its practical conditions, any more than by the mere study of the theory of architecture, he could acquire the ability to build a temple. And by the mere practical observation of conditions, one never can be able to grapple with unexpected changes in conditions, or to meet any situation which he has not met before; any more than by mere practice at carpentry, he could acquire the ability to build a temple.

To decide which is the most important is like deciding which is the most important link in a chain. But it may nevertheless be pointed out that the *final* act, the application of principles to conditions, is distinctly a practical act. President Cleveland's declaration, "We are confronted with a condition, not a theory," was an admirable statement, by the man having the responsibility, of the necessity for *action*, not discussion, at that particular juncture; that, granting all the knowledge of principles and of conditions possessed by the Chief Executive, and granting the necessity for that knowledge, yet, nevertheless, the most important thing was the purely practical act of meeting the purely practical conditions.

Strategy and Tactics.—Writers divide warfare into strategy and tactics; and while it would not be true to state that strategy concerns itself with the theory of war, and tactics with its practice, yet the interesting statement may be hazarded that the atmosphere enveloping strategy is that of deliberate and quiet thought; while tactics breathes action and the shock of arms.

STRATEGY.

An attempt to make a complete exposition of strategy within the limits of this paper would be ridiculous. A few interesting points connected with it may be mentioned, however, as bearing on the subject.

One point is the curious idea regarding its meaning, which is evident even in some dictionaries, that strategy is a science or art concerned principally in deceiving; whereas it is a word derived directly from the Greek word *strategos* which means general, and nothing else. Strategy deals with war, with everything pertaining to it. It may even be said, by a not very great stretching of the meaning of words, to include the subject of tactics; because, although strategy and tactics are very different, yet no strategical plans would be complete which did not include a consideration of the tactical conditions which would probably arise, and the tactics which would and could be employed. The domain of strategy is tremendous, and embraces not only all the means of preparation for war, and the handling of armies and fleets out of actual battle, their equipping and provisioning,—but also the causes of war, and even the political relations of nations who may possibly go to war. In fact, in the higher regions of strategy, the military and the political considerations sometimes become so closely interwoven, that it is hard to distinguish between them. In such cases, and when the civil and military authorities act in harmony, each understanding the principles and conditions perfectly, as was the case in Germany and Japan before their great wars, strategy rises to its highest point, and a nation goes to war, with the war almost already won.

Relation of Strategy to Affairs of Civil Life.—An interesting characteristic of strategy, as compared with tactics, is its closer relation to the affairs of civil life. There is a wide and deep gulf fixed between tactics and any doings whatsoever in civil life; but no such gulf removes the strategist from the rest of human kind. Strategy deals with the movements of large bodies of men and with the preparations of plans to execute definite projects; but so does politics in its larger sense, and so does statesmanship. Strategy deals with the providing in time of the proper appliances for doing mechanical work; but so does the management of every railroad and engineering company, and large industrial corporation. Strategy takes into account the time required to come and

go; the providing of food at proper intervals; the state of the weather and the general question of ways and means; but so does the plan of every ball, parade and Sunday-school excursion.

Thus, it will be seen that, in spite of its high sounding name, and in spite of the widespread ignorance concerning it, strategy is nothing more than the exercise towards military ends of the same kinds of activity as are found in the larger affairs of civil life. In fact, if the word "military" or "naval" be used in the narrow sense in which it is usually employed, strategy need not be considered a strictly military art or science, nor need a good strategist be necessarily a good "military" or "naval" man. A man might be an excellent strategist, and yet be physically an arrant coward. He might be able to devise excellent strategical plans, and yet be unfit to command a company, or be entrusted with a pulling boat. He might be able to dominate a council of war, and yet, of his own initiative, be unable to make a decisive move. Not only is it possible for an excellent strategist to be ineffective in command, but excellent strategists have often been ineffective in command. This statement is not to be taken as meaning that the excellent strategists here considered may fail because they are "theoretical men" and not "practical men," because no man can be an excellent strategist unless he be a practical man, *in his vocation*, strategy. It simply means to point out that both reason and experience show that, while strategy is the highest branch of the military science and the military art, yet it lives rather in the study and the office than the field; and is not brought directly into contact with those distinctly picturesque, stirring and dangerous scenes, which are associated in our minds with the words "military" and "naval," as used in their customary but narrow sense.

Strategy is Preparation for Battle.—Strategy being a subject which many books have been written to expound, a subject containing many sub-divisions, a subject of vast extent, and characterized by extreme precision, it would be foolish to attempt to define it in a few words. Yet to the writer, a phrase of three words seems to express its aim—"preparation for battle." Of course, the word "preparation" must be here used in its broadest sense, and include all the things that are done—even for a long time before. This preparation includes not only what is done in war, but what is done in peace, before war. It includes the col-

lecting and compiling of the data that are needed; the preparation of general plans, indicated by the data; the subsequent preparation of detailed plans; the raising of the proper forces, in personnel and material; their disciplining and equipping; the correct exercise and instruction of the enlisted men; and more important still, the correct exercise and instruction of the officers; the mobilization of the forces, when war comes, in accordance with plans already made in peace; the most advantageous handling of the forces before battle comes, in order that the force put into battle may be larger and more effective than the enemy's; then, leaving to tactics the conduct of the battle, the re-arrangement of the forces after battle, and the task of preparing them for another battle on the most advantageous lines.

Strategy More Important than Tactics.—When it is noted that strategy operates over a very much longer time than tactics does, that tactics merely employs during a few critical hours the weapons which strategy has handed it, and when one notes that any effect is merely the result of some cause or causes, and that strategy supplies most, if not all, of the causes by which victory or defeat results, he can safely declare that, not only is strategy more important than tactics, but that tactics is merely a child of strategy; that whatever tactics may be used in battle, those tactics are the result of the strategy preceding the battle, preceding it perhaps by many years. There were causes more deep-seated than the skill of the commanders at the front which brought about the soul-stirring triumphs of the Germans and the Japanese; it was not, at bottom, the lack of individual merit in commanders that caused the disasters of the French and Russians. It was not wholly the lack of tactical skill in the field at the beginning of the Civil War that caused the hopeless confusion and the resulting waste of life; but the absence of proper strategical preparation *before* the wars began.

The utter lack of foresight before the Civil War caused it to begin under conditions which Cæsar or Napoleon, or any man who ever lived, could not possibly have met successfully at first. Now this lack of foresight,—or at least of preparation—was due more to the fault of the civil authorities, especially Congress, than of the naval and military authorities; yet it was not Congress that received the abuse. The war ended in the way that any sensible person would have expected; in that side whipping which was

the superior in numbers and in wealth. No other result could possibly have occurred; and yet the commanders who happened to be in high positions on the victorious side at the end, received applause just as excessive as had been the abuse in the beginning.

Both the excessive abuse and the excessive applause arose from the same cause; the non-recognition of the fact that the result of any battle is due to many causes, besides the actual conduct of the battle itself. So clearly is this true that one might declare, using a figure of speech sometimes called an "Irishism," that some wars and some battles have been decided before they were fought. Wilson, in his "Ironclads in Action" in speaking of the utter unpreparedness of the Chinese fleet at the Battle of the Yalu, says "the Chinese were clearly doomed to defeat, when they saw the Japanese smoke rise above the horizon."

Victory Results Mostly from Causes Preceding a Battle.—The writer does not wish to be understood as advancing the idea that a battle is like a machine which, after being set going, will keep going in the way it was designed to go, until it is run down; nor as advancing the idea that the personal skill of the chief during the actual battle, has little influence on the result. But he does wish to be understood as advancing the idea that this factor, the factor of the personal skill of the chief *during* actual battle has been overestimated, at least in naval battles. This idea can best be illustrated by the following table, which shows the number of fighting ships which were engaged in the principal fleet actions of modern times; and indicates the curious fact that, up to the battle of St. Vincent, nearly every victory went to the side that had the most ships; while, since then, it has gone to the side which, *from causes preceding the battle*, had the best trained personnel.

In the battle of Saint Vincent, while appreciating to the highest degree the personal skill of Jervis and Nelson, as shown in actual battle, we must admit that the Spaniards were utterly untrained. The same may truly be said of the French and Spaniards at Trafalgar, the Chinese at the Yalu, the Spaniards at Manila and Santiago, and the Russians at Port Arthur, Fusan, and the Sea of Japan. Regarding the French at the Nile and the Italians at Lissa, it seems enough to say that the result in each case, was due to conditions preceding the battle, by which the French and the Italians were caught entirely unprepared.

Again the writer wishes to insist that his intention is not to belittle the work of the commander on the spot, even while point-

BATTLE.	SHIPS.	VICTOR.
Four Days, June 11-14, 1666	British ....44 — Dutch.....80	Dutch.
Solebay, June 7, 1672	British. French. } 101 — Dutch.....91	Indecisive.
The Texel, August 21, 1673	British. French. } 90 — Dutch.....70	Indecisive.
Stromboli, January 8, 1676	French....20 — Dutch.....19	Indecisive.
Beachy Head, July 10, 1690	British. Dutch.. } 60 — French....70	French.
La Hogue, May 21, 1692	British. Dutch.. } 99 — French. ..44	{ British. Dutch.
Toulon, February 22, 1744	French. Spanish } 27 — British 29	Indecisive.
Minorca, May 20, 1756	British ....12 — French....12	Indecisive.
Quiberon, November 20, 1759	British ... 23 — French....21	British.
Fort Saint David, April 29, 1758	British .....7 — French.....8	French.
Ushant, July 27, 1778	British ...30 — French....30	Indecisive.
Grenada, July 6, 1779	British ....21 — French....25	French.
Guadeloupe, April 17, 1780	British ...21 — French....23	Indecisive.
Cape Henry, March 16, 1781	British .....8 — French.....8	Indecisive.
Porto Praya, April 16, 1781	British .....7 — French.....8	Indecisive.
Madras, February 17, 1782	British .....9 — French. ..12	Indecisive.
Trincomalee, April 12, 1782	British ....11 — French... 12	Indecisive.
Cuddalore, July 6, 1782	British ....11 — French....11	Indecisive
Trincomalee, September 3, 1782	British ....12 — French....14	French.
Les Saintes, April 9, 1782	British ....36 — French....33	Indecisive.
Les Saintes, April 12, 1782	British ....36 — French .. 30	British.
First of June, 1794	British ....25 — French....26	British.
Saint Vincent, February 14, 1797	British ....15 — Spanish ...27	British.
The Nile, August 1, 1798	British ....13 — French....13	British.
Trafalgar, October 21, 1805	British ....27 — French.. Spanish. } 33	British.
Lake Erie, September 10, 1813	American..9 — British.....6	American.
Lissa, July 20, 1866	Austrian...7 — Italian.....9	Austrian.
Yalu, September 17, 1894	Chinese....12 — Japanese..12	Japanese.
Manila, May 1, 1898	American..6 — Spanish....6	American.
Santiago, July 3, 1898	American..5 — Spanish....4	American.
Port Arthur, August 10, 1904	Russian....9 — Japanese..12	Japanese.
Fusan, August 14, 1904	Russian....3 — Japanese...6	Japanese.
Sea of Japan, May 27, 1905	Russian...12 — Japanese..12	Japanese.

ing out that most of the naval battles of history have been decided by conditions prevailing before the battles. And he believes it

most important that this matter be considered thoughtfully; because it is within our own power to get a fleet well built, equipped and trained, but not within our power to produce an admiral absolutely sure to do well when the crisis comes. No one can tell how any one man will act at any one time. The most alert men are sometimes absent-minded; the most intelligent men sometimes do stupid things; an attack of indigestion will shake the steadiest nerve, and personal like or dislike has often clouded the judgment of the clearest mind.

Now it means a good deal to realize that the outcome of every war has been due absolutely to causes existing before the war began; that whether the strategy and tactics were good or bad, after the war began; whether officers and men were well- or ill-instructed, disciplined or fed; whether they were brave or cowardly; devoted, indifferent, or traitorous; the conditions did not create themselves, nor did they come into being suddenly, but were the result of causes running back into times of peace. It means that "now is the time of salvation"; and it puts a new significance into the proverb "peace hath her victories, no less renowned than war."

Civil Authorities are the Principal Causers of Defeat in War.—And does it not mean a little more? Since the result of every war has been due, at the bottom, to causes existing long before the war, though perhaps not recognized; and since officers who have had to stake their all on the result of a war have naturally been more desirous of making preparation than the civil authorities, does it not follow that the men who have really been the causers of the disaster of any war, have been, not the military, but the civil authorities? Who really caused the slaughter on both sides during our own Civil War? Was it the Army and Navy? Or was it the civil authorities, who would not permit the Army and Navy to be large enough to get experience as even one corps or one fleet? If the United States had had an adequate army and navy, in which the higher officers had had experience in handling corps and fleets, and if a small minority had seceded, and tried to organize and train another and smaller fleet and army, how long would it have taken the larger and well-trained force to whip the smaller force, before it was gotten ready, and thus stamp out the war? Would not one battle have been enough? Would four years have been needed, and the slaughter of countless men, and

the aimless, though gallant fights of hordes of soldiers, under commanders imperfectly trained until too late—and the untold expenditure of money?

Necessity for Adequate Army and Navy to Repress Disorder.—Surely, these questions are easy to answer. Surely, any one can see that the United States in 1860 was like any other community with a police force too weak to enforce the law. In any city, on election day, a little civil war is liable to happen, if the police force be too weak to preserve order. The Civil War would not have occurred if the government had had an army and navy strong enough to keep it down. The passions of the people of the north and south would have been kept under control, and the questions at issue would have been decided as questions even more burning are being decided in Russia now; by peaceful means. The army would have been used, just as it is being used in Russia now, just as it has often been used in the States and cities of our own country, to prevent the settling of disputes by fighting, and to compel their settling by peaceful means. It seems strange to refer to Russia as an example of anything good in government; but if the Russian army during the past two years had not been strong enough to preserve order, order would not have been preserved; and a result would have occurred somewhat like our Civil War.

But even if our army and navy in 1861 had not been strong enough to prevent the solution of the pending problems by Civil War, an army, say twice as large as it really was could have ended the war much more quickly than it was ended; not only because of its greater size, but because the officers would have known more about the handling of large bodies of men. But how *could* Captain McClellan, or any other officer in the army, know anything practically about such things? How could they possibly know anything about strategy or tactics? The little army had always been divided into little parties all over our vast country, and neither officers nor men had ever had a chance to drill together in large bodies. This was not the fault of the army, but the fault of the civil authorities. Therefore, the people responsible for the waste of life in our Civil War were the civil authorities. The civil authorities let the police force of the country get so weak that it could not keep down violence; and then, when violence broke out, they tried to repress it by means of a mass of volun-

teers so ignorant and so numerous, that they would have been unwieldy in the hands of Napoleon himself. The little regular army was almost as ignorant of real war as the volunteers. What possible good did their elementary training do, when not a hundred, but a hundred thousand men had to be fed, organized, drilled, marched and fought? Now the civil authorities did not cause the bloodshed, and the sickness and heartaches of our Civil War by intention; but they did cause them by ignorance. They caused them by their ignorance of a very old subject—the correct relations between the civil and military authority. Not only this, but they themselves caused their own ignorance by their exaggerated fear of militarism, and their refusal to listen to military men, and learn anything about military matters.

Need for the Intelligent Sympathy of the People.—Noting these things, and remembering that the underlying cause of the success of the Japanese army and navy was the intelligent sympathy of the Japanese people; while the underlying cause of the unpreparedness of the Russian army and navy was the unintelligent apathy of the Russian people, remembering that a "stream cannot rise higher than its source," and that the source of all our military strength is in the people themselves, it is easy to see that a most important thing for us to do is to develop an intelligent sympathy for the American navy in the American people.

Happily, this work has already been begun by the Navy League. Its value to the navy and the country, if it succeeds as Navy Leagues have succeeded abroad, will be so great that . . . . officers cannot overestimate it, or do too much on parallel lines. The people must be educated, and made to see that it is their duty to insist on an adequate navy, and very much to their interest. If this can be accomplished, if the people can be made to see that (this sounds like a paradox, but is not) they are at the bottom just as responsible for the outcome of a war as we are, we shall have no more trouble in getting sufficient money from Congress, proper support from the daily press, and freedom to develop the navy along correct strategical lines.

Necessity for Practical Work.—Of course, nothing that has been written here is intended to mean that officers should neglect their regular duties, to become either bookworms, or "boomers" of naval things. Neither is it intended to suggest a less attention to the ordinary details of drill and discipline, and the proper con-

duct of daily life. All of these things need more attention, not less; but it is a delightful fact that intellectual interest in the principles of any profession, if guided by a desire to grasp their real meaning, and not to dream about them as abstractions, gives greater interest in the practice of the profession and not less. For this reason, one need not fear that more study of the principles of war, and more zeal in spreading information concerning them, will cause any lessening of interest or ability in the practical details of life. The details will become more interesting, not less; they will cease to be lifeless things, and stand out as examples of living truth; they will change like the vague shapes we hardly see at night, when the sun and the blue sky bring out their beauty of form and color.

TACTICS.

For the officers of armies and navies, tactics has always had more interest than strategy, because it seems more "military." Certainly tactics touches more intimately our daily lives, and seems less an intellectual abstraction. And while strategy smells of books, and papers, and maps, and figures, and intelligence reports, and everything else that can be dull; tactics stirs the blood with cavalry charges, and the picturesque maneuvers of .... ships, and the clash of fleets and armies. Strategy suggests study: tactics suggests action. And yet tactics requires study.

Theory and Practice.—Tactics, like nearly every art and science, may be divided into theory and practice; theory ascertaining the best way in which to do a thing, and practice doing it. A professor of mechanical engineering may be able to deduce, and describe, the best way in which to drive a given nail into a given kind of wood, and yet be less able to drive it than an ignorant carpenter. In this case, the division between the theorist and the practical man is very great; but if the work needed more education than driving a nail, the difference would be less; as for instance, the difference between the professor of mechanical engineering and the driver of a locomotive; and not only because the practical man had moved towards the theoretical man, but because the theoretical man had moved towards the practical man.

This leads to the suggestion that perhaps the theory and the practice of tactics are not very far apart; because nearly all the

men in tactics are officers of similar education, and because one cannot even imagine a good practical tactician who did not have a good knowledge of the theory, or a man with a clear theoretical comprehension of tactics, who had not attained it after considerable practical experience. Exceptions must be admitted, of course; perhaps the most striking one is Clerk of Elden, whose scheme of naval tactics Nelson and Rodney followed; but who, it is said, was never on board a warship in his life.

The suggestion here made that the theory and the practice of tactics are not very far apart, does not mean that the man who is the best at either, will necessarily be the best at the other. For it is obvious that the kind of man who would be a good strategist might be a good theoretical tactician; and yet, from various reasons, such as excitability, or weak nerves, be unable to handle men, even in time of peace; and that, on the other hand, a very good practical tactician, in a limited sense, a man who could handle extremely well, small bodies of men or ships, under conditions with which he was familiar, might have so little grasp of the theory, as to be wholly at loss, if put in charge of large affairs, or confronted with a novel situation.

Broad Subject of Tactics not Important to Naval Officers.—But it is far from clear that the broad subject of tactics has much practical interest for naval officers. There can be no doubt that a science and an art of tactics, *might* be developed, applicable to both the land and the sea; but it seems sure that no such art or science exists to-day; and it also seems sure that, if it ever be developed, it will be found that the underlying principles, common to both land and naval tactics, will be few and simple; because the conditions to which they must be applicable, are so exceeding different. The writer will go so far as to declare that he has never seen a definition of tactics, or a description of its aim, which seemed to him even to include naval tactics. Many books have been written on the subject of tactics; but the most casual inspection of them shows that "tactics" meant to the writers the tactics of soldiers. Not only have the writers made no endeavor to include naval tactics, but their failure is so marked, and evidently so innocent, as to betray the fact that they never even thought of naval tactics.

Danger of Applying Principles of Land Tactics to Naval Tactics.—If this statement be correct, it follows that naval offi-

cers should be very careful how they attempt to apply the principles of land tactics, even if they are called "principles of tactics," to naval conditions. The temptation to discover similarities is very great to a certain class of active minds; but when great ingenuity is required to make an analogy, and one finds himself pleased with its brilliancy, then it is the time to scrutinize it carefully and determine whether the analogy be true or false: and when the matter is so important as naval tactics, he is justified in throwing the burden of proof entirely on the affirmer of the analogy.

And let not this declaration be considered academic:—for it is practical in the highest degree, and concerns the very ground work of Naval Science. Much has been written and said by naval men of influence, in behalf of or against certain schemes of—say naval organization, naval ships, and naval tactics—quoting, as arguments, some principles of purely land tactics, and adding that "principles are always true."—Yes, principles are always true, but the way in which some people understand some principles may be utterly untrue; and principles which state a truth about one thing cannot necessarily be held to state it about a different thing. Captain Bunsby's celebrated aphorism, "The bearings of this observation lays in the application on it," came not so far from being a wise remark, ridiculous as it really was; for we are very apt to take some general truth, and make with it an application that is utterly erroneous.

An instance of an attempt to apply to naval tactics a principle found good in land tactics, is the contention advanced by some that, in a fleet fight, each fleet should have a reserve. The only argument the writer has ever heard advanced is that "It is a principle of tactics"—meaning land tactics. It is a principle that a land force should have a reserve;—yes—but why? Simply because it has been found to be a good plan to have one. But it has never yet been found good for a naval force to have one; and therefore it is not a principle of tactics, but only a principle of land tactics; and no one has a right to insist on applying it to naval tactics.

Armored Cruisers not Comparable to Cavalry.—A somewhat similar fallacy is the oft-repeated justification of the armored cruiser—that it is comparable to the cavalry of an army.

In the first place, it is not comparable to the cavalry; and in the second place, no one has proved that a navy needs anything comparable to the cavalry. It is not comparable to the cavalry, for the reason that it has not nearly the same speed, relatively to the other vessels of a fleet, that the cavalry has to the other branches of an army; and because it has not nearly the same power, either offensive or defensive, relatively to the other ships, that the cavalry has to the other branches. And a person would have to labor hard to prove that a navy needs something comparable to cavalry:—for how can one find on the open sea, and within the restricted space which even the largest enemy's fleet can cover, any opportunity for those quick surprises, or those sudden attacks on exposed lines of communication, stretching away for miles, which is one of the principal employments of cavalry; and can one even imagine a squadron of armored cruisers making a charge in battle against battleships, at all comparable to those charges of cavalry, which again and again in history, have been hurled with irresistible violence against a vulnerable point?

The writer does not wish to be misunderstood as questioning the usefulness of armored cruisers; for he is merely questioning the logicalness of an oft-repeated argument. At the same time it may be well to point out here, that, though we can find a use for our armored cruisers, *now that we have them*, yet nevertheless, if we had ten battleships, instead of our ten armored cruisers, our fleet would be much stronger.

If it be true, as the writer believes, that tactics as practiced on the land must be very different from tactics, as practiced on the sea, it follows that not only will it do little good, from a naval standpoint, to devote much time to it, but also that it may do harm; not only by taking our attention from the subject of strictly naval tactics, but also by misleading us.

Battleships More Powerful than Armies.—In fact, it may safely be stated, that, while the main principles of strategy apply to military operations on both the land and the sea, the conditions which govern tactics on both the land and the sea are more apparent by their absence than by their presence. On land, an army of 100,000 infantry carries 100,000 rifles. If those 100,000 rifles were all fired simultaneously the combined energy of the bullets, *at the muzzle*, would be equal to only 7 per cent more

than the energy of two 12″ guns in one battleship; and *if* the total energy of those 100,000 men could be concentrated, it would not be more than 25,000 horsepower, about 50 per cent more than the horsepower of the *Maine*. The 100,000 men would weigh about 7200 tons, about half the weight of one large battleship.

But the fire of 100,000 men cannot be concentrated, and neither can their energy in horsepower, nor their weight. Furthermore, the energy of the bullets falls to zero about 4000 yards away. So the statement would be correct that a battleship has more effective power, by far, than 100,000 infantry. As to defensive power, an army has almost none; whereas, a battleship has armor which gives it a defensive power on a par with its offensive power. Therefore, we are warranted in saying that, by reason of its inherent design, a battleship is a much more powerful thing than an army of 100,000 infantry. This does not mean that a battleship could do on land what 100,000 infantry can; but it does mean that, on its element, the sea, it is a more powerful thing than an army of 100,000 infantry is on its element, the land. Furthermore, 100,000 men cannot march 240 miles a day; but a battleship can go 240 miles a day with ease.

In this comparison, no inclusion has been made, thus far, of the artillery and cavalry of an army; and it is evident that a fair comparison between the powers of an army and a ship would not be possible without considering the army's artillery and cavalry. Let it be supposed then, that the infantry of 100,000 men is accompanied by artillery in the ratio of 5 guns to every 1000 men, that is 500 guns; and say 17,000 cavalry, a not unusual proportion. The power of the 500 guns, each throwing say a 14-pound shell, would aggregate, if fired simultaneously, and concentrated on a near target, the fire of eight 12″ guns; and the cavalry of 17,000 could fire, if dismounted, 17,000 rifles, less in energy than five 5″ guns; and the energy of the 17,000 horses, if concentrated, would be equal to 17,000 horsepower.

Now, the 500 guns would need at least 6000 men besides horses. So the army would number 100,000 infantry, at least 6000 artillery with 500 guns, and 17,000 cavalry; at least 123,000 men; and their fire at the muzzle would equal only about ten 12″ guns, and five 5″ guns;—not very different from the armament of our projected ship, but without her speed and armor. Such an army is commanded by a general; the ship will be commanded by a captain.

No mention is here made of coast artillery, and for two reasons. One reason is that the coast artillery does not accompany an army; and the other is that, while in some countries, the coast artillery is part of the army, in others, it is part of the navy; and in other countries, like France, part is under the army, and part under the navy. Therefore, coast artillery cannot be considered as belonging to an army rather than to a navy.

Doubtless, it will be objected that it is not reasonable to compare armies and fleets by the standard of the muzzle energy of the projectiles and the horsepower of the men and ships. This, of course, is true; but the purpose of the last paragraphs was not to make a comparison, but on the contrary, to point out a difference. At the same time, it is well to note that the sole reason for having an organized army instead of an undisciplined horde of men, is that an army, organized, drilled, and equipped, is, *because* it is organized, drilled and equipped, a *machine*, possessing a vast amount of energy, which can be directed to a definite object, better than an undisciplined horde of men can; and it may be further pointed out that the reasoning above proves that our projected battleship will be a machine of a higher order, possessing in her gun-fire a greater amount of *concentratable energy* than an army of 123,000 men; possessing in her engines an energy more than half as great as that of all the men and horses in that army, if the energy of those men and horses could be concentrated, which it cannot; possessing also the ability to go farther in any length of time, and be self-supporting for a much greater length of time; and possessing in her armor a protection, which being practically on a par with her offensive strength, may truly be said to double her offensive strength.

Ineffectiveness of Armies Makes Their Operations Protracted.—Again the great weakness of an army is its utter dependence on its communications; "the secret of war," said Napoleon, "lies in the communications." But a battleship has no such weakness. Almost the whole effort of tactics on the land concerns directly or indirectly, the threatening, or protecting, of the communications; but a naval force is concerned with this only in so far as may be necessary to protect its auxiliaries, which are, or ought to be, in plain sight.

The managing of an army consists in a constant arranging and rearranging of thousands of little units, spread out over many

miles, *in the endeavor to concentrate power,* at one place or another, where it may be needed. *But in a battleship, concentration has already been effected.* The greatest example of concentrated power in all the world is a battleship.

It is because of the comparative ineffectiveness of armies that the operations of armies last so much longer than the operations of fleets. If the energy of two armies could be concentrated in two units, each unit the size of a fleet, a war could be decided by one battle, lasting one hour. The proof of this is at hand in the war between Russia and Japan; the armies fought for many bloody months, without decisive issue; and the issue was decided by the naval battle of the Sea of Japan in less than one hour.

NAVAL STRATEGY.

Many books have been written on strategy; but few on naval strategy. And while it is true that the main principles of strategy apply to warfare on the sea as well as to warfare on the land; yet, nevertheless, most of the books on strategy deal so specifically with the application of those principles to warfare on the land, that a great deal of thought and study is needed, to work out their application to warfare on the sea; an amount of thought and study that few naval officers have time to give.

It is true that Coulomb's "Naval Warfare" and Mahan's books on "The Influence of Sea Power" deal with naval strategy. Yet they deal with it secondarily, not primarily. Their books were not written to expound naval strategy, but to prove theories that the writers held. Coulomb proves that "command of the sea" has always been essential to success in wars between two countries that bordered on the sea; and Mahan's books prove that the possession of the dominating power upon the sea has always been essential to every nation that has ever achieved greatness. Their books, excellent as they are, deal with things that happened many years ago; they are mainly historical.

Of course, books like these are essential to the study of naval strategy; and historical examples must be cited, in order that we may see what was done, to make naval strategy successful in the past, in order that we may be helped (not guided rigidly) to see what should be done, to make naval strategy successful in the future.

So, it would seem that, even if such books underlie modern naval strategy, they do it in the same way that books written twenty years ago on steam engineering underlie modern steam engineering; and that a student of modern naval strategy has as much difficulty in learning modern naval strategy, by reading books twenty years old, as a student of modern steam engineering would have, in learning modern steam engineering, by reading books twenty years old.

In fact, does he not have more difficulty? Books written on steam engineering twenty years ago, were clear and precise; and they were written by so many men, and were subjected to such rigid criticism by experts, and were based on such trustworthy data, and their conclusions were tested by so many practical trials, that they give the student of to-day a foundation that he can depend on absolutely. But no books written twenty years ago can be called clear and precise in their dealings with naval strategy; none have ever been subjected to very rigid criticism by experts, because there have been no experts; their data can hardly be called trustworthy, because much of it had to be guessed at; and their conclusions have not been tested by many practical trials. So the student of to-day has not even a foundation that he can depend on.

What we need is a book, in English, which shall point out clearly the application of the principles of strategy to naval conditions:—*not* to general naval conditions, *not* to naval conditions in the galley period, or the sailing days, but to naval conditions *now*.

A few such books have appeared in German within the past few years. But, while some of us are acquainted with the thrilling novels of France, and can converse with señoritas in the eloquent language of Spain, the professional books of Germany are as the hieroglyphics of Assyria.

When one remembers that our Naval War College was the first institution ever formed to study naval strategy; that this War College received for many years the whole-hearted condemnation of most naval officers, who would have put it to death, but for Luce, Mahan, Sampson, Taylor, Goodrich, and a few others; that it was started as late as 1885; that not until the advent of the General Board did the recommendations of the college

get an influential hearing before the Department; and that all other Powers, except one, have seemed to be as lax as we, one can see why naval strategy is so little understood.

Probably there is not a subject in the world more dimly comprehended. Not only are its principles uncomprehended, but the conditions as well. Discussions are held on the most fundamental points. As to the comparative value of speed in battle, the greatest diversity of opinion exists. The same may be said as to the size of warships; among officers of the highest rank and the greatest intelligence, an incredible contrariety of views can be found. A great difference exists as to the relative value of coaling stations and colliers. Is there among the members of the naval profession any agreement as to the way in which the armor should be distributed? What kind of a bow is the best—ram, straight, or clipper? What is the best method of securing the best officers in the various grades? Is a naval officer primarily a warrior who wields certain weapons, or is he primarily an engineer, who utilizes his engineering powers for the purpose of making war? Why have all the navies built certain armored cruisers; although battleships would have been very much more useful, while just as cheap to build, and cheaper to maintain? Should a navy do nothing but train its officers and men to handle their ships and guns with the skill which only specialization can accomplish, letting the marines do the work of landing; or shall it continue to devote a lot of time to soldier work? Shall the navy be built so that it can "prey on commerce," or shall it let the commerce go? What is the best clothing for the enlisted man? etc., etc.

These are all commonplace matters, and can hardly be said to be included in naval strategy, except as conditions. Yet they concern the constituents of naval force; and as such, they underly naval strategy, and must be understood before naval strategy can be applied successfully to naval war.

It may be objected that a like diversity of opinion exists in all professions; and that we do not know about them, but do know about our own. But a little reflection will show us that some sciences, such as engineering, rest on very sure foundations; and that even in medicine, which is, next to naval strategy, the most confused science in the world, we do not find physicians disagreeing about fundamentals, say the efficiency of vaccination. In

other words, the ratio of admitted theories and practices, to disputed theories and practices, seems very much greater even in medicine than in naval strategy. In regard to naval strategy, it may truly be said that "the navy is at sea."

The writer does not pretend to have any knowledge of naval strategy. It is his ignorance of naval strategy, and his inability to get any definite knowledge about it, that calls his attention to its undeveloped state; for if it be a fact, as it seems to be, that wars on land have been decided more by strategy than by anything else, it is high time that naval officers found out at least the underlying principles of naval strategy. It seems fairly sure that no nation except one, has studied it. If this one nation has studied it, and we do not, and if we fight her, we shall probably be whipped,—and deserve it.

Of course, the study of naval strategy of itself, can do little practical good, until we determine the proper constituents of naval force to which the strategy is to be applied. We must study the conditions and then the application of the principles to the conditions. Taking up some of the various points of difference of opinion just mentioned, concerning the proper constituents of naval force, the cases may be stated somewhat as follows:

Colliers vs. Coaling Stations.—The advocates of colliers insist that a fleet should be an integral thing, so composed as to be the utmost its country can do; that, to this end, it should be able to strike a blow that will crush the naval resistance of the enemy. They point out that our war with Spain was decided by the naval battles of Manila and Santiago. They point out that, in the war between Russia and Japan, even after the Japanese army had had its great victories in Manchuria, even after the Russian reverse of August 10, a decisive victory by Rojesvensky over Togo, would have given Russia control of the sea, between Japan and her army, so that the Japanese army would have been unable thereafter ever to ever get any supplies from Japan. They point out that, even if Rojesvensky had been very much later than he was in getting to Japan, this same result would have occurred. They point out that a fleet of sufficient power, provided with means of going to battle, will surely win any naval war; that the only thing needed in a naval war is, first to have an adequate fleet, and second an adequate means of getting it where it ought to go. They point out that, no matter how fully adequate a fleet may otherwise be,

no number of coaling stations now possible to any country, except Great Britain, will suffice to help her much to go to any distant point; and that, if she cannot go where she is needed, she will be of no use. They point out that, even in the case of Great Britain, who has had the foresight to get nearly all the places possible for coaling stations, the risk, difficulty, and delay would be very great of getting coal at just those stations, with a vigilant enemy hovering about, who knew where the coaling stations were;—whereas, a fleet, accompanied by colliers, could coal at convenient places without the knowledge of the enemy.

The advocates of coaling stations declare the collier plan to be utterly impracticable, except on a scale so small as to be useless; by reason of the enormous expense involved, and the handicap on the movements of the fleet, imposed by the colliers. They say that the cost of colliers as fast as modern battleships, and capable of carrying enough coal, both for the other ships and themselves, would be utterly beyond possibility; and that, if the colliers be slower than the battleships, they nullify the value of the speed of the battleships, which so much fighting power is sacrificed to get. To this, the apt reply is made, that colliers and auxiliaries do not have to be very fast, because they do not accompany battleships into battle; that battleships do not have to be fast, except in battle; that, in going to battle, the whole fleet, from a combination of reasons, should go at the most economical speed.

Speed.—Both the advocates and the opponents of high speed in battleships are agreed that speed is a desirable quality for purposes of both strategy and tactics, but disagree as to its value relative to other qualities which must be sacrificed to obtain it. This question has been discussed so much lately, that nearly all that can be said on either side has been already said.

The differences of opinion concern principally two points, one strategical and the other tactical.

The strategical point is whether or not it is very important for a battle fleet to be able to get to a distant point quickly. The advocates of high speed point out that ability to make junction between the separated parts of a fleet may be the deciding point of an entire war; and they show that this was the controlling idea in the British maneuvers of 1904, which were intended to simulate the most modern conditions of naval war. The dissenters argue that no such condition as a divided fleet ought to be con-

sidered for a moment. They insist that we must have our fleet together long before war breaks out; in fact, keep it together always. They contend that it will not make any difference whether or not the fleet goes quickly to the scene of action, provided the whole fleet goes together, and that it arrives in condition to do the best that is in it. They declare, furthermore, that, no matter how fast the battleships may be, they will never be able to go very fast very far:—first, because of the necessity of economizing coal, and second, because the probabilities are almost certainties that some of the fighting or auxiliary vessels will make the fleet slow down.

The tactical question, though very complex, may be stated briefly, as follows:

The high speed advocates hold that the faster fleet can not only go into and withdraw from battle at will, but that it can secure a position of advantage—such as a position to sunward or windward—and can maintain it as long as it wishes; also that it can draw ahead of the slower fleet, to a position where it can cap or T, and where it can use its torpedoes more effectively than the slower fleet. The dissenters admit all the advantages except the capping; but they deny their great importance; and they deny flatly the ability of the faster fleet to cap (except in restricted waters), pointing out that all the slower fleet has to do is to head away from the faster fleet, compelling it to move in an arc of longer radius than that on which the slower fleet will move.

The subject is evidently one that it is difficult to submit to quantitative analysis. This is apparent from the following considerations:

1. Inasmuch as battles, *at the present time*, can be decided by gun-fire only, and as we must presuppose equal gunnery skill on both sides, the question is, with a given weight of hull, what weight shall go into motive power, and what weight into guns, armor and ammunition, in order to attain the most effective gun-fire—not in a fight between two ships—but in a fight between two fleets?

2. It is not necessary to begin at the beginning, and suppose that ships must be designed *de novo;* because the fact that all great navies use 12″ guns and corresponding armor, and are building ships of at least 16,000 tons, makes such conditions a starting point. It would be foolish, for instance, to build 8″ guns to attack

armor intended to keep out 12″ shell; and it would be equally foolish to install armor that could withstand only 8″ shell, when 12″ shell were to be fired at it.

3. Sixteen knots and two turrets with 12″ guns do not need 16,000 tons. We find ourselves, therefore, with a considerable weight, which we can put into motive power, and into guns, armor and ammunition. How shall we divide it?

4. It is easy to calculate how much a given weight will increase the guns, armor and ammunition of a ship, because we know how much they weigh. It is also easy to calculate how much a given weight will increase the speed of a ship. If we could only calculate how much a given increase of speed above 16 knots would increase the fighting power of a—not ship but fleet—the problem could be solved by arithmetic.

5. Let us imagine two fleets of 16 ships each. If they are abreast in parallel columns at 6000 yards, which now seems to be considered the standard fighting distance, it is plain that both fleets can use their maximum broadside fire, and that neither has a tactical advantage so far as gunnery is concerned. It is also plain that, so long as they remain in parallel columns, neither side has any great tactical advantage; though ability to concentrate on the leader of the slower fleet would be a tremendous advantage, *if* the admiral of the slower fleet were so foolish as to put his flagship at the head, where the faster fleet could concentrate on it, and where it could get support from ships astern only.

6. It is possible that the fleet of the greater speed might be able to T the slower fleet. But no case is known where this actually happened; and there seems no good reason why it ever should happen, except under extremely improbable circumstances.

7. The faster fleet may be able, not only to get a position in advance of the slower fleet, but to form on a line of bearing at an angle to it, refusing its own rear; thus getting the advantage of ability to concentrate on the leading ships of the slower fleet at a less average range than that of the slower fleet. If the average range of the faster fleet were 6000 yards, and that of the slower fleet 7000 yards, the advantage would be about in the ratio of 7 to 6. If, in addition, the four slow rear ships could not use more than their bow fire, which would be say half their beam fire, the slower fleet would, for the moment, be reduced practically from 16 ships to 14. But this ratio would not exist, except during

the existence of these conditions; because the very fact of the comparative isolation of the four rear ships, while decreasing their gunnery efficiency, would also decrease the damage they would receive. Inasmuch, as the 16 ships of the slower fleet would undoubtedly be reduced in practical efficiency below 16 but not so far as to 14, perhaps we shall not be far wrong, if we estimate that their efficiency would be reduced from 16 to 15.

8. As the gunnery advantage, by the ratio of ranges, would be reduced as 7 to 6, and by the tactical position from 16 to 15, we may conclude that the resulting ratio would be as 7x16 to 6x15, that is as 112 to 90, or about 100 to 80.

9. If no greater advantage were given by superiority in speed than this, we should have to take this as the basis on which to calculate the ratio between the weight given to speed and the weight given to guns, etc. In fact, in discussions on naval tactics, hitherto, this advantage has received ten times more attention than any other.

10. Now, can superior speed do anything else?

Yes; under some conditions.

It will be noted that all of the considerations just mentioned refer to the range in one case, and the number of guns that can be brought to bear in the other case; but it is easy to see that the difference between the average ranges of two contesting fleets cannot be made very great *if these average ranges be great,* and neither can the difference in the number of guns brought to bear; except in the highly improbable case of capping.

Now, everyone knows that the difficulties of accurate shooting are so great, that an extremely small disturbing cause can reduce the number of hits on a distant target by a large proportion; a seemingly trivial difficulty, for instance, could reduce it from 2 to 1. A ship even thirty feet high, 6000 yards away, subtends an angle of less than six minutes; so that to hit it, a gunpointer must not make a mistake greater than three minutes, on either side, even if his sight be set at the exact sight-bar range; or, if he fires exactly at the right instant, his sight-bar range must be correct within half the danger space:—which, for a target thirty feet high and 6000 yards away is less than 100 yards.

Let us remember that a ship is rolling slowly when only rolling ½° per second, that an error of 3′ of arc will be caused during such rolling by firing, with a turret gun, at the wrong instant by

only 1/10 second of time; that, in order to spot near a target 6000 yards away, with an error not greater than 100 yards, a spotter even if 100 feet high, must instantly *estimate* the angle between the water-line of the target ship and the splash, with an error not greater than 20 seconds of arc; even if the water-line be unchanging, and the sea flat:—while, in fact, the water-line of a ship moving fast in the high waves of deep water, is not only rising and falling all the time, but is rising and falling varyingly at different points of her length; and a splash 6000 yards away, even when waves are only ten feet high, between crest and trough, is continually rising and falling, *with an extremely irregular motion*, from a position apparently about six feet below, to a position apparently about four feet above, the *normal* water-line of a target ship 100 yards beyond; while carrying on much more irregular antics, with relation to her *actual* water-line.[1]

Now, if it be so very difficult to hit a target, and so very difficult to tell how much to correct a miss, what is the best thing to do, in order to make both more difficult still—for the enemy?

Two things suggest themselves:

(a) Place him so that his ships will roll more than ours.

(b) Make it more difficult for him to estimate or measure distances, and to tell when to fire:—in other words, make it more difficult for him to *see*.

The first thing is very difficult to accomplish, for the reason that fleets are almost sure to head in the same direction; but the second is easy to accomplish, under certain conditions, if one has superior speed, by—

(a) If there be considerable wind and rain, keeping to windward. Who could do good shooting to windward in a high wind and rain?

(b) If there be a bright sun, keeping to sunward of the slower fleet, until near say an hour before sundown or a few minutes after sunrise and then attacking. Who can fire accurately, or spot accurately, with the sun in his eyes, the target ship in shadow, and its water-line invisible?

Could a gunpointer make twice as many hits per minute at a

[1] This was written when the navy had faith in "vertical spotting," and was intended to show, incidentally, the folly of that faith. The fact that "vertical spotting" has since been practically abandoned does not affect the desirability of making it difficult for the enemy to *see*.

brightly illuminated target 6000 yards away as he could at a target which had a bright sun directly behind it? The answer may seem a curious one:—that he probably could, if his skill were very great; and that the greater his skill, the greater the difference would be. But the answer really is not curious; because great skill in any art is dependent on good conditions for exercising it: and bad conditions injure the performance of good artists more than the performance of bad artists; whether those artists be gunpointers, billiard players or pianists.

As all navies are now developing good gunpointers, we see that the question is of the effect of strong sunlight in the eyes, on the shooting of good gunpointers.

In order to test the effect of sun-glare, let any man mark a rectangle 3″ long and ⅕-inch high on a card, and hold the card one foot from his eye. The rectangle will represent the horizontal and vertical angle of a ship having 30 feet freeboard and 450 feet length, 6000 yards distant, *when viewed through a telescope—sight having a magnification of ten.* Let him hold this card, first away from the sun, and then towards the sun, shielding his eyes as best he can; and then answer this question; bearing in mind that the cross wires sweep across that rectangle in ⅕ second, and supposing the firing to be done from a turret gun, and the ship rolling ½° per second.

Probably nearly every man, after trying this, would declare that a skilful gunpointer could make more than twice as many hits per minute with a low bright sun behind him as with it behind the enemy; and some might give a greater ratio; bearing in mind that the blinding effect of sun-glare becomes unbearable, after a few minutes.

Now, the fleet with the greater speed can, with plenty of sea room, get in any direction it pleases from the slower fleet, and make her take any line of bearing, by threatening to cap; it can also defer action—within limits—until it gets conditions the way it likes them, and then attack at once; so that superior speed under some conditions, could be made to more than double the value of the gun-fire of one fleet, as compared with that of the other.

11. When we come to deciding how much superiority in speed is needed to do this, we find it a little difficult; but it seems as if two knots would be needed. Two knots per hour is 200 feet

per minute, and 24 knots in a day of twelve hours. The sun is to the east in the morning, and to the west in the evening; and a fleet that was on the wrong side would have to pass entirely around the slower fleet, and form four miles off on the other side.

So, it seems as if a fleet which could go two knots per hour faster than an enemy's fleet, would—after meeting *on the open sea*—be able to abstain from battle until the weather conditions, either because of wind or rain, or because of bright sunlight, enabled it to take a position such that it could make more than twice as many hits per gun per minute as the enemy.

12. It may be objected that no admiral would dare to abstain from battle so long as might be necessary, in order to obtain the conditions he desired. To this, the answer may be made, that the delay would, as a rule, be more disadvantageous to the slower fleet than to the faster; for the reason that, as the two fleets would be running at about the same speed during the waiting interval, the slower fleet would be burning up the greater proportion of its coal.

In fact, if the fleets found each other when equally full of coal, it might be possible for the faster fleet simply to abstain from fighting until the slower fleet's coal were all consumed. Of what use would the superior gun power of the slower fleet be then? If the opposing admiral happened to be of an unamiable disposition, he might then simply steam away, taking all the colliers and supply ships, and leave the other fleet immobile on the ocean, admiring its powerful guns.

13. This reasoning seems to lead us to the conclusion that a fleet of 20 knots, having four 12″ guns per broadside of each ship, could whip an equal number ships of equal size, having a speed of 18 knots and eight 12″ guns per broadside.

14. *But* this reasoning is based on an important assumption: the assumption that the fleets meet so far from land, and under such conditions, that no strategical requirements may compel the faster fleet to fight when it does not wish to do so; on a calm day and with an overcast sky, for instance, thus surrendering the tactical advantages of a sunward or windward position.

15. Very few fleet battles and no fleet battles under steam, have been fought far away from land. And it can hardly be said to be probable that future fleet battles will be so fought; because battles are not fought for the mere sake of fighting, and are not

arranged like prize fights to take place at some point far away from anywhere. The meeting points of fleets are determined by strategical conditions. Usually, one fleet wants to fight then and there, because the conditions are favorable; and the other fleet does not want to fight, but is compelled to do so. It is only rarely that both sides think the conditions advantageous.

The battles of the Yalu, Manila, Santiago, Port Arthur and Tsushima illustrate this point; and though the admirals could have delayed battle a little while, the strategical conditions were such in every case, that no admiral could have delayed it very long.

16. This shows us that an important claim of the high speed advocates is absolutely unwarranted; the claim that the faster fleet can abstain from action, and go into action, exactly when it pleases. The claim is good tactically, but not good strategically:—except perhaps for a few hours, or under peculiar conditions, or when both fleets wish to fight. Did Togo try to defer action and wait for more favorable conditions? Would he have been justified in doing so—even though his fleet was much faster than the Russian fleet?

17. Another contention of the speed advocates—that the faster fleet can withdraw from action when it pleases—cannot be admitted, except when the faster fleet is getting the advantage; and then it will probably not wish to withdraw. If it is getting the worst of the fight, it will be because the heavier battery of the enemy is damaging the ships; and then they may not be able to go anywhere—except down. So, we can see that the conditions under which a ship may fight are so uncertain, that, even though we can see that speed, may *under some conditions,* more than double the fighting power, and though we can calculate how much a given weight will increase the guns and armor of a ship, and how much it will increase her speed, we cannot tell how much speed will affect her fighting power, in general.

It may be suggested, however, that the weight to be put into a ship's motive power, guns, armor and ammunition may be considered a "constant"; that any increase in speed, even if the guns, armor, and ammunition remain unchanged, increases her fighting power; and also that any increase in the guns, armor and ammunition, even if the speed remains the same, increases her fighting power. Therefore, the fighting power of a ship may be

considered as the product of some function of the weight of her motive power, and some function of the weight of her guns, armor and ammunition. Now, if $a + b$ is a constant, the product of a and b is the greatest when a and b are equal. Bearing this in mind, we probably shall not be far wrong, in dealing with this much vexed question, if we conclude that, in order to get the maximum product of the useful effect of speed and the useful effect of guns, etc., these two factors should be considered equal in importance. The writer sees no way of stating this mathematically, or even quantitatively; but it does not seem as if it would be impossible to a mathematician.

Meanwhile, it would seem true that, if any ship is much faster than ships she would naturally fight, but with much weaker battery and armor protection, the proper equality of speed and guns, etc., has not been secured; and that the same is the case, if a ship is much slower than ships she would naturally fight, but with much heavier battery and armor.

Probably some officers will challenge the assumption that sunglare can reduce the number of hits per gun per minute in a ratio greater than 2 to 1. Such a challenge would be most sensible; and it would be well to make it, if a test of the correctness of the assumption could thereby be brought about. It seems strange that no such test has been made under modern conditions, if, in fact, it has ever been made; for no test of more practical usefulness can be imagined, or one much easier to make. It is merely necessary for a gunpointer to fire for half an hour—say with a six-inch gun—in the early morning, at a distant target, when the sun is behind him; and then to fire half an hour in the afternoon, over the same range, when the sun has gotten behind the target. If a comparison be made of the hits made during the two periods, a quantitative decision can at once be made. It would be well to make the same test on succeeding days, with other gunpointers, in order to eliminate the effects of chance.

While it is true, however, that it is practically only by gunfire that battles can be decided *now*, yet it is evident that we shall have to consider the torpedo very soon; and it is not impossible that the speed and range of the torpedo may soon be increased so much that the torpedo will become more important than the gun. The torpedo is much younger than the gun, and possesses in a higher degree the potentiality of the future.

It seems pretty sure even now that we can depend on 4000 yards range at 25 knots; and greater ranges at less speed. This will increase greatly the advantage of superior speed in ships. For instance, imagine two fleets of sixteen ships each, at a distance between ships of 400 yards. Suppose the faster fleet has gotten on the sea side, and crowded the slower fleet so close to the land that it cannot get any closer. Let the faster fleet draw in to such a position that the slower fleet are on the quarter with 6000 interval between the columns, and calculate the speed of the slower fleet, which it can then do easily. Suppose it to be 16 knots. Now let each ship of the faster fleet fire two torpedoes exactly abeam and at a torpedo speed of sixteen knots. If the torpedoes go straight, each slower ship will be hit by two torpedoes; if the torpedoes do not go straight, each of the thirty-two torpedoes has about one chance in three of hitting one of the sixteen target ships; so that the probabilities would be that the sixteen ships would be hit by at least ten torpedoes. And it is doubtful if any of the faster ships could be reached.

The suggestion may here be made that the regulator of the torpedo should be marked for speed as well as range.

Distribution of Armor.—Perhaps in the whole realm of Naval Science, there is no matter on which there have been more various ideas expressed or larger sums of money dispensed. It would take a book to describe the almost infinite ways in which armor has been applied to ships. Considering the expense of armor, and its tremendous usefulness, and the fact that the subject has occupied the calculations of the highest engineering talent the world possesses, an ordinary man would suppose that some general plan would be agreed on, in its main features, as the best. But the most casual reference to Brassey or Jane shows that the fashions in armor are almost as numerous as the fashions in ladies' hats.

Possibly, one principle has been gradually advancing towards general acceptance; and that is, that the main office of armor is to preserve from destruction by gun-fire the ship itself; and that the part of the ship whose preservation is more important to the safety of the ship than any other part is the water-line; the word "water-line" here meaning a belt so far above and below the normal water-line, that a projectile penetrating it, or a torpedo striking it would not let the water in, either below the protective

deck, or just above it. The safety of the ship itself being thus provided for, another principle now advancing towards recognition is that the guns should be so large, that there will be few of them; and that the armor should be concentrated around them, and around the bottoms of the smokestacks, leaving the other parts of the ship, above the water-line, to make as little resistance to shells as possible.

In the opinion of the writer, there is still another principle, which is that the idea so often expressed, that we must expect to lose men, and that the armor is not intended primarily for them, is as foolish as any idea possibly could be. Of all the things in a ship, which things are the most easily injured, and repaired with the most difficulty? Which are the only things that are rendered utterly useless for their purpose by a projectile going near them? Which are the things on which the control of the ship and firing of the guns directly and indirectly depend? Which are the greatest and most capable mechanisms in the ship? The men. Therefore, after the safety of the ship which carries the men has been assured as far as practicable, is not the next thing to protect the men? In the opinion of the humble writer, the protection of the personnel has not received enough attention. This applies to all the men, but especially to those directing the ship itself, its gun-fire, and its signals.

Kind of Bow.—Until recently the ram-bow has been the fashion. Now it is going out of fashion. Why? So far as the writer is informed, there are no good reasons existing for and against the ram that have not existed for thirty years, except increased rapidity and accuracy of gun-fire. Without apparently any other new evidence, some officers have suddenly concluded that the occasions for the use of the ram will be very few; and that the ram will always be a menance to friendly ships, and a foe to tactical drills. But suppose a thing that easily may happen: suppose that two hostile fleets, one with rams and the other without rams, fight without victory coming decisively to either side, until the ammunition is gone. This is not an impossible case at all; in fact, a very probable case, if the fleets be well-matched. Would not the ram-bow fleet have the other fleet entirely at its mercy, unless the other could run away? The ram is a very clumsy weapon; but like a great many clumsy things, it has the element of rugged strength, and may remain useful after more

delicately organized things have ceased to be of use. And in the mêlée which may happen—and often has happened—in battle, when ships would be close together, a vessel with a ram would be more effective than a vessel without one, especially if about to be raked by a ship ahead.

Personally, the writer rather inclines to retaining the ram, but his reasons are not many. The ram may be likened to the bayonet; and we all know that there was a movement for many years to abolish the bayonet, and that the bayonet was about to be abolished, when its extensive and decisive employment in the Russo-Japanese war reinstated it in military favor, and with a vigor and promptness that left nothing to be desired. Now, the bayonet is a ram, and the ram is a bayonet. They are the weapons of last resort. When the decisive moment really comes; when armies or navies meet in the intimate death grapple, the bayonet, or the ram, does its horrid work; and nothing remains to be done thereafter.

Best Method of Promotion.—It is a truism that the purpose of organization is to unify the efforts of many men; to enable one man to direct the efforts of, say a hundred men, in such a way that the result will be the same as if he himself did the work of those hundred men.

If a great number of men, taken haphazard in any community, be examined, and then compared with an equal number of men similarly examined haphazard in a similar community, it will be found that the average of ability, intelligence, and character is about the same in each lot; it will also be found that most of the men in both communities do not differ very much from the average. So clearly is this fact known, that the ungrammatical expression "the average man" is well recognized and understood. In comparing men, the various qualities which go to make them up are usually lumped under the heading "ability." The average man, therefore, may be considered as a man who has the ability to do an average amount of work of average quality in a given time. Let us call him the "unit man," and define him as the man who can do a unit of work per day. Let us admit, without argument, that there are a great many "unit" men everywhere, and that they are very easy to get.

Now, almost every man will work to the best of his ability at work which amuses him, or which is to bring him immediate re-

ward. The purpose of most organizations, however, is not to amuse or reward their employees, but to make them work for some definite end which the organization wishes attained, and which may be of no interest to the employees. The problem of the organization is how best to bring this about. Evidently the problem is one of administration, and may be divided into three parts.

1. How to make each man do his allotted work. This may be called "driving."

2. How to manage so that the work done shall be directed along a definite line. This may be called "managing."

3. How to direct that definite line so that it shall be the best one. This may be called "directing."

1. *Driving.*—The first thing to do, in order to drive well is to divide and sub-divide the organization in such a way that small parties of men shall be in the charge of men of a rank just above the rank of the "unit" man, these parties combined in larger ones under men of higher rank, and so on. This is the general scheme in nearly every large organization, and may be seen perhaps in its simplest form in the organization of a regiment. It is clear that most of the work of driving each man directly must be done by the men in charge of the small parties; and yet, that a great amount of driving must be done indirectly by the men in charge of combined parties, and that the amount of driving done by one man increases with the rank of that man. For instance, the corporal of a squad drives eight privates; but the colonel drives his subordinate officers and every private in his regiment, just as much as a corporal drives eight privates, though less directly. Now, no matter how nearly perfect the system may be, by means of which the colonel is enabled to drive the officers and men, it will be more difficult for him to drive them, *with any given degree of efficiency*, than for the corporal to drive eight privates *with that same degree of efficiency*, unless the machinery be perfect; and this it can never be. No matter, therefore, how much power the colonel have placed in his hands, no matter how highly educated he may be in using that power, he will never be able to drive the large number of officers and men in his regiment so well as the corporal drives his privates, unless he be a man of more personal ability than the corporal; because he must make up by his personal ability for the inefficiency of the mechanism, which increases with the amount of the mechanism.

2. *Managing.*—This work is so different from that of "driving" that a man who can do one well may not be able to do the other well. To manage well, the principal quality would seem to be what is usually called "good judgment," a quality which is entirely independent of force or tact, and which may exist either with or without it. To illustrate the ability which enables a man to manage well may be done by supposing a man to lack it entirely, who when in charge of the work of a thousand men is able to make all of them work exceedingly hard, and yet who manages so that the work of 500 men is exactly opposed to the work of the other 500 men. This would be an extreme case; but all of us have seen the work of many men brought almost to naught by bad management. Now, no matter how nearly perfect the mechanism of any organization may be, no matter how much power those in high positions may have, no matter how much knowledge and education they may command for managing the work of the men below them, it is plain that only an absolutely perfect mechanism could enable those having many men under them to manage their work as efficiently as those men who have fewer men; *unless* the officials controlling many men have more personal ability than the officials controlling fewer men.

In comparing the qualities necessary to success in managing with the qualities necessary to success in driving, it may be stated, that, in the lower grades of authority, the qualities that fit a man for driving are the most important; but that in the higher grades, the qualities that fit a man for managing are the more important; and that they increase in importance as the loftiness of the position, the "rank" increases. In the highest rank, while the personality of the chief finds abundant exercise in "driving," this driving must be done more by what is called "magnetism" than by any other thing; by inspiring all with, not only willingness to work, but clearness of understanding as what to do. And it may be interpolated here that this power is one of the greatest that a chief can have; and that, unless the chief have it, the most willing subordinates become inefficient, because they do not know what to do.

Nevertheless, though the chief finds abundant exercise for his ability in "driving," yet the "managing" must be more especially his employment. This idea is illustrated by a battleship, in which the greatest amount of work done, is the work done by the en-

gines; but in which the special employment of the officer of the deck, is not in seeing that this work is done, but in seeing that it is so managed as to move the ship straight on the course prescribed.

3. *Directing.*—Above the task of driving and of managing so that the driving is done along a given line, is the work of directing the direction of this line. No one, probably, will doubt for a moment that this is the most important matter connected with any organization, or will gainsay the declaration that the highest possible exercise of the mind and the spirit of man, is in directing along the right path the actions of many men. So great is the faculty of doing this, that, when it exists in its highest form, organization itself is not needed; and men like Confucius, Shakespeare, Franklin, Raphael, Wagner, and Praxiteles direct the minds and souls of men by the unaided power of genius. Lowering our eyes to the things of daily life, we see the exercise of this power, at the present day, principally in the creating and developing of great commercial organizations. In former days, it was displayed principally in the directing of armies. But warfare has become only the occasional employment of men, instead of the principal one; and commercial organizations have assumed an importance undreamed of even fifty years ago; an importance that is rapidly increasing.

A few moments' thought will show that the work of directing is entirely different from that of driving or managing. The same man may do all these, as does a general of any army or the admiral of a fleet; but the faculties employed in doing them are so diverse, that there must be very few men capable of doing all three well. A. T. Stewart is said to have been such a man; a man equally able in getting out of every man whatever ability was in him; in managing the business in its largest features and in its smallest details; and in directing also the entire external policy of the concern. So able was he in each way, that, starting comparatively poor, and by perfectly legitimate business methods, as distinguished from speculating, he became the greatest merchant in the country, and initiated certain reforms in business methods that have continued ever since.

But though it was the combination of abilities in these three ways that made Stewart great, yet it can hardly be denied that the principal factor was the large grasp of mind, which made the

wise directing of so large a concern a possibility. The finding of unit men to do unit work was easy; the finding of men to manage the various departments was more difficult; not only because those men had to exert to a degree far beyond the ordinary, certain faculties of the mind, in keeping clear a great many skeins that tended to tangle up, but because they had to drive as well. There are thousands of organizations in this country, that give every evidence that they are well managed. But when we look for organizations, which like Stewart's, have been so directed as to attain to great success, do we find many? Far from it. When we search for examples of what is great in anything, we naturally find few examples; simply because greatness is unusual, or it would not be great. In stature, in physical strength, in any human attribute, in even the trees of the forest, departures from the normal are rare, and are rare in proportion to the greatness of the departure.

This being the case, what is the particular reason that a certain few organizations have advanced to unprecedented success? Why among the manifold organizations of our country, do a very few organizations stand out in such bold relief? The country is open to all; all have the advantages of its climate, its government, and its resources. There are thousands of organizations; but the country knows only a few like the Standard Oil Company, the Westinghouse Company, the Pennsylvania Railroad, the Vanderbilt system, etc. Why have these organizations achieved such wonderful success? Whatever the cause was, it must have been a wonderful cause; something as wonderful as the men Rockefeller, Westinghouse, Scott, and Commodore Vanderbilt, who gave them definite direction. Perhaps the cause was the genius residing in those men. This seems possible, when we reflect that, in some cases like the Bell Telephone Company, not only the directing of the company, but its starting, its creation, were due wholly to one brilliant idea in the brain of one man. What other cause then can be accepted as sufficient?

In the opinion of the writer, no other cause can be accepted as sufficient. History shows that, back of every movement, political, religious, or commercial, there can always be found, if the search be continued far enough, one inspiring mind. We find behind all great movements, men like Peter the Hermit, Bismarck, Washington, Luther, Rothschild, Edison or Ito; and similarly in smaller

matters, and in our own country, certain names are connected inseparably with all our greatest institutions and corporations.

Now, if it be true that it has been the brain of some great leader that has been the vivifying spark of all great improvements, then the amount of ability of the leader of any organization must be the principal single factor of its success. And this conclusion is not very unreasonable to expect; because the individuals doing the actual working and driving and managing must be practically of the same kind in one organization as in others. Therefore, the real difference between two organizations, measured by the ability with which they are directed, is in the ability of the two men directing.

If this be granted, even in part, it must also be granted that the most important thing for any organization is to get the best possible man at the top; and the next most important thing is to get the best available men in charge of the divisions and subdivisions.

Such a conclusion, though here arrived at by a circuitous route, can be reached at once by the simple process of recognizing that all organizations are composed of human beings only; that the iron and brass, and steam, and coal employed are merely inert matter; that the work of the organizations must be done by human beings only, and that each human being will do his best work, in proportion as his ability is adapted to the work given him. For, in designing a human organization, as in designing a machine, the soft materials, and the hard materials, and the stiff materials, and the highly organized materials, need to be put to the work which each is best adapted to do.

Application to the Navy.—If we try to apply to the navy some of the ideas just advanced, it may occur to us that the duties of driving fall naturally to the petty officers and divisional officers of ships; driving and managing to the executive officers and captains; and driving, managing, and directing to the commander-in-chief. It may also seem that, in any well-disciplined fleet, the principal duties of the petty officers and divisional officers should be in driving; of the executive officers and captains in managing, they being relieved of the necessity of driving to an extent depending on the efficiency of the petty officers and divisional officers; and that the principal duty of the commander-in-chief should be in directing; he being relieved of the duties of driving and

managing to an extent depending on the efficiency of the officers of his staff, and of the officers in the various ships.

We of the navy are so familiar with the work of driving and managing that no statement about it is required. But how many of us have any conception of what directing means? How many men in any vocation are ever called on to direct? And how many men who have been called on to direct have been able to do it well? While a man is driving, he is employed mainly in exerting force, even if he is assisting it with tact. We all know that men of very great education and mental ability are not required in order to do this well; a master-at-arms for instance does not have to be highly intellectual.

While a man is engaged in managing, he is exercising certain ordinary objective faculties of the mind, the principal ones, besides those used in driving, being sound judgment, patience, and that peculiar faculty for arrangement which the executive officer of a ship is continually employing, in keeping up his station bill.

But directing calls into play faculties beyond all these. Perhaps the most common one is far-sightedness, which is an extension of what is usually called "foresight." By foresight is usually meant a quality by the use of which a man takes note of what is likely to happen, and makes his plans accordingly. Foresight is constantly used in managing; but as the word is ordinarily employed, foresight takes note of things which an ordinary mind can easily anticipate. An admiral who reckons the probable expenditure of coal and provisions in his fleet, and takes measures to offset the expenditures by timely and adequate supply, is exercising foresight. So is a shopkeeper, who buys in time the things likely to sell well during the coming season.

Of course, foresight is constantly used in directing. In fact, directing could not be done without it, because directing consists almost wholly in laying plans for the future and then executing them.

Two Kinds of Directing.—But there are two kinds of directing —directing along a known course, and directing along an unknown course. Directing along a known course requires an ability not much higher than that used in managing, and not very different from it. Every general manager of a company, every bishop of a diocese, every captain of a ship, every admiral of a fleet, so long as the questions presented can be solved by rule, or decided by precedent, does this kind of directing.

But did Stewart become the greatest merchant of his time by doing this kind of directing? Was it this kind of directing that made the greatness of Alexander? Was it by this kind of directing that Columbus moved his little fleet across the vastness of an unknown sea? Has this kind of directing ever accomplished anything unusual?

Every one will answer "No"; that, though this kind of directing is essential if any large enterprise is to succeed, yet, it of itself, is not the vital spark. It seems necessary in the same way that bodily and mental health were necessary to Shakespeare; necessary, though not of themselves forming elements of his genius.

What kind of directing is it then, which imparts to some enterprises, and some organizations, a success beyond that which others reach? If it be a quality in the mind of the director, what is that quality?

Qualities of a Great Director.—Evidently, it must be some quality which gives a man a clearer idea of what is going to happen, or of what can be made to happen, than the ordinary man possesses. This does not mean that he has the gift of prophecy: but it does mean that, since no man can make anything happen in the past, or even in the present; since no man can make anything happen except in the future, the fact that a great director can make things happen more advantageously than other men, shows that he has a clearer idea of the future than other men.

It must be clear to any one that, since large enterprises take a long while for their development, and since the only time at the disposal of the director is future time, the director most capable of directing must be the man, who (other qualities being equal) has the clearest insight into the future.

But since the mind of man is incapable of prophecy, by what process can a great director get insight into the future?

The writer, not being a great director, cannot answer this question; and he feels that even the men who seem to have the greatest insight cannot answer it; but neither can an artist tell how he paints things that are beautiful.

One thing seems pretty sure, however, and that is that all great directors have great powers of imagination; of seeing things with the eye of the mind; of mentally combining, arranging and rearranging men, things, and events, so as to create effects unknown before. These powers are the powers of genius, because they are

creative; but why is not a man who arranges men, things, and events, to create a campaign as much a genius as a composer who arranges sounds, to create a sonata; or a painter who arranges colors, to create a picture? *"Sans le don d'imagination, point le grand général."*

Two Men of Genius as Directors.—Perhaps the writer's meaning may be made plain by pointing to two men who stand before the world so clearly, that they need not be named. Each man is gifted highly with great powers of driving; each manages the complicated mechanism of a large country with the adroitness of a Japanese juggler; and each is gifted with a supreme genius for directing, by means of which their countries have been literally jumped along the line of progress. No one can read of what they say, and write, and do, without perceiving the creative faculty; which, before it can create, must first see what can be created, and second how to create it. Now this seeing can be done by the imagination only. Of course, the imagination must be clear and well controlled; for an imagination that is vague and uncontrolled is very near insanity. This suggests the true difference between genius and insanity.

A Standard by which to Compare Them.—Perhaps a slight digression may be pardoned, while one difference between these two men is pointed out; the difference that, in the case of the Emperor, we are told continually of the hard work he does, and the hard work he makes others do; while in the case of the other man, we are told of the enormous things he accomplishes. This may not be a bad standard, by which to compare the greatness of the men.

The writer has not mentioned the cases of great geniuses, with the idea that we should try to fill our grades with geniuses, but merely to suggest what may be called a "First Law of Organization," as herein deduced from the experience of organizations in general.

Men of Great Ability in the Navy.—It may be objected that men of great ability have not appeared in our navy, except in war. With the exception of Admiral Luce, and a few others, this statement perhaps is true. But how do we know; how, under our system, can a man of great ability make himself known? Frank J. Sprague, who if not a genius, has proved himself to be the greatest mechanical genius the Naval Academy has produced,

and who is to be credited more than any other one man in the world, with the creation of the trolley car, got no recognition in the navy, beyond being called a crank. At the time he resigned, he had made a reputation in the scientific and engineering circles of every civilized country by his original and brilliant method of testing dynamos and motors at the Crystal Palace Exhibition in London; a method selected in competition with other methods proposed by European scientific men of international fame. And yet, Sprague was only an American midshipman on a month's leave from the *Lancaster!* Our navy was then just beginning the reconstruction period, and Sprague was a man the navy could not afford to lose. If he had been kept in the navy, and given the opportunity to expend in the navy's service half the energy, and inventive and constructive ability that he expended in the engineering world, it is inconceivable that we should not have a better navy than we have now, and developed at less expense. It is inconceivable that the navy would have made so many mistakes, trying to find out the best kind and size of ships, and the best types of apparatus of different kind. The Sprague Company never showed any such weakness; yet its problem, while on a smaller scale, involved more unknown qualities, and its solution required ability of a higher order.

Sprague's ability was not utilized, because it was not recognized. And even if it had been recognized theoretically, it would not have been possible to recognize it practically; because our system did not permit him to be promoted to a position where he would have had adequate field for the exercise of his extraordinary talents, *until he had become an old man.*

And Sprague was not the only good man lost to the navy by our present system. Many names can be mentioned: Westinghouse, Benjamin, Thompson, Miller, Stayton, Dana Greene, Nixon, Breed, Weeks, and many others; men of initiative and enterprise; who saw the "golden years" of early manhood go sterilely by; with no opportunity for doing anything, except what they were told to do, no outlet for their energies, and no hope of betterment.

Not to utilize able men until they are old, is to violate the fundamental principle on which every great organization has built its greatness.

Since we have always violated this principle ("the right man in the right place") can we wonder that we have on our hands so many ships that have eaten up our appropriations, and our allowance of officers and men, without adequate return? Can we wonder that our navy got down where it was in 1882; that we left torpedoes out of our ships; that we have installed inturning screws in thirty-seven vessels; that we have put sighting hoods on turrets, when parallel mirrors were used on fortifications by Leonardo da Vinci 400 years ago; that we have no naval-range finder, no battle signals, no general staff; that we have put the steam whistle where it deafens the officers of the deck and the lookouts, while they are listening for fog signals; that our conning towers are not adapted to their purpose; that we have no means of steering a compass course in battle; that we have no means of handling a fleet in a fog; that we have acres of armor just thick enough to insure the maximum effect of hostile shell; that we have smokestacks unnecessarily high, which interfere with fire control and signalling; that most of our flag officers have never learned to be flag officers; that the War College, and nearly all improvements, have been opposed; that Admiral Luce was not appreciated till he was seventy years old; that we take narrow views of the naval profession; that we have no clear ideas of naval strategy or tactics; and are only beginning to have a definite naval policy?

We are told that it would be "impracticable" to have any other system of promotion in this country, and under our government. If this be true, we must recognize the fact that we must work under a handicap, and cannot accomplish much. We must continue to get our ideas of everything naval from abroad, and to know that our profession is the only one in the United States that follows behind its corresponding profession in Europe.

Conclusions.—Perhaps, we may now conclude that,

1. The naval profession is not different fundamentally from others, except that, like the army, it is an organization, as well as a profession.

2. In any organization the most important matter is to get in the various positions the men best fitted for them.

3. This work is important (and therefore difficult) in proportion as the positions are important.

4. In the positions which direct the lines along which the efforts of the organization should be made, the highest possible ability should be secured.

5. In the naval profession, no attempt seems ever to have been made to do this. Whether or not it is possible to do it is another matter; but the curious lack of individuality among naval officers, except where they have been pushed to the front by being in command in some battle, must be accepted as a fact. It is an old naval saying that "we are all tarred with the same brush"; and this expresses the writer's meaning fully.

6. In any organization, the endeavor to get certain kinds of men in certain kinds of positions, develops individuality instead of crushing it. A broader statement even may be made—that evolution itself consists very largely in developing individuality—in going from the simple to the complex.

7. Therefore, there must be something in naval organizations that is very wrong; something which is not only opposed to progress in general terms, but which specially prevents the development among its members of the highest qualities that are needed. Of course, organization must necessarily tend to homogeneity among men of the same grade; but it is carried too far if it represses the ability of those fit to rise. The homogeneity of the privates of the French army did not prevent the rise of Napoleon and his marshals.

8. Clearly the naval profession, especially in this country, is confronted with a very serious problem; but fortunately its members have finally wakened to the fact, and are doing their best to solve it. It is at least appreciated that the question of how to get men in the places they belong in, *especially the high places*, is the most important matter that the navy has before it; that, if that problem be solved, all others will solve themselves; also that the fact that it is a hard problem is not a reason for neglecting it, but the reverse.

What Is the Best Clothing for the Enlisted Man?—No one will deny that the matter of clothing is important. In all grades of society, in all countries, and at all times, clothes have occupied a great deal of the attention of the people, and caused the expenditure of much money and time. Unfortunately, and unwisely, much of the money and time have been spent, not in attempting to produce the best clothing, but in attempting to pro-

duce the most beautiful clothing. The result, in many cases, is clothing which is neither good nor beautiful; often it is not adapted to its purpose in a useful way, and does not please the eye in an artistic way.

Doubtless this statement will not be denied by any observant person; but the writer holds that, while its truth is apparent everywhere, it is more apparent on board a man-of-war than any where else. It is admitted that a handsome young seaman, going ashore in a new suit of dress-blue, looks very well indeed; but he would look very well indeed in any new and well-fitting suit of clothes: just as well as in a seaman's suit. If not, if a seaman's suit makes a man look handsomer than any other kind of suit, why do not other men than sailors wear it, or something like it? As a fact, no man wears a sailor's suit, unless he is compelled to do so. So much for the seaman's garb, as a thing of beauty.

Now, is it adapted to its purpose? If so, in what way? The usual answer is that a sailor must be active, and that a sailor's garb permits activity. If this be the reason, why are all the engineer's force dressed in it? Why all the artificers, and the messman branch, and the rest? In the ship in which the writer is now serving, there are three hundred and twenty-nine men who wear "sailor clothes." Are they all "sailors"? One hundred forty-four are, and one hundred and eighty-five are not. Why are these one hundred and eighty-five men dressed in such extraordinary garments, which may have been appropriate once for a fore-top-man, but which have never been appropriate for a fireman? Imagine a fireman or an oiler, or a coal-passer trying to do his work in his uniform. He could not do it well. Why dress a man in a uniform which he cannot wear, *and which we know he never does wear*, when doing his *regular work?* If there be no definite reason, we seem forced to the conclusion that, for more than half the men in this ship, (and in most ships) who wear sailor's clothes, no reason can be given, on the score of either beauty or utility; also, that the fundamental principle in designing uniform is violated, and the fundamental reason for having uniform, forgotten.

Furthermore, besides these three hundred and twenty-nine men, there are thirty-six who wear caps and sack coats. These men are, by reason of their character, intelligence, and conduct, the

kind of men that we should like to have known on shore as belonging to the navy; but their uniform does not indicate this to the average person who sees them.

Now, as to the men of the seaman branch; is their uniform adapted to their work? Can a man do his work well at his gun, or in his turret, with his knife lanyard hanging down and his neckerchief? Can he do his ordinary work about decks conveniently with these impediments? Does not his flappy collar get in his way, when the wind blows? Does not his flat cap blow off when the wind blows, unless he takes the grommet out; and does he not look very slouchy if he does take it out? Does his flat cap, or his white hat, or his watch cap keep the sun out of his eyes; and is not an important use of a hat, or cap, to keep the sun out of one's eyes? If not, why does every civilized man wear a hat or cap, that does keep the sun out of his eyes, except those who are deprived of this privilege? Does the white hat look well after it has been washed two or three times?

Why do our men have to wear such extraordinary inexpressibles? Why do those inexpressibles open across the abdomen, a fashion discarded by other men more than a generation ago? Why is the only survival of this ridiculous custom to be found in navies? Is any useful purpose served?

Why not have a simple uniform, loose enough for free movement, but not slouchy? Why not have a simple cap and visor, such as men wear in so many kinds of out-door employment? Why not have a shirt with a sensible collar? Why have such enormous neckerchiefs? Why have a knife lanyard? Why not let the men wear trousers like other men? Certainly the present garb has not even the merit of being cheap. The uniform of the soldier, or marine, is just as cheap, if not a little cheaper.

And there must be something about the present garb that tempts the men to get out of uniform. In a certain ship, in a certain length of time, twenty-five bluejackets were reported as out of uniform, but not one marine. The ratio of bluejackets to marines is about seven to one; so one might expect seven times as many bluejackets to be out of uniform as marines, but no more. And it is a matter of common knowledge that, in every ship, bluejackets are constantly reported for being out of uniform, but very rarely a marine. May one not conclude that the marines' uniform is better adapted to his work than the bluejacket's is to

his work? So may not the fault be a little ours, and not entirely the bluejacket's?

Certainly it is worth thinking about. Perhaps a uniform more adapted to modern man-of-war conditions would remove many causes of discomfort on board ship, and enable officers to devote to other purposes the time they now spend in measuring collars. In regard to shore-going, it is well known that the uniform of the seaman does him no good when he goes ashore, but a lot of harm. It is a hard fact that the most exemplary man in sailor clothes is suspected on shore, and is not welcomed except by saloon keepers. He would be happier if he went ashore in a uniform less identified in the mind of the people with great bravery at sea and great drunkenness on shore.

The writer proposes a plain blue or white cap, with an anchor in front; a loose blue or white shirt, with a turn-down collar, buttoned to the throat with small navy buttons; a plain black necktie, no knife lanyard, and plain blue or white trousers of ordinary cut, except that there would be a lacing behind, to permit the trousers to be worn without suspenders, and yet to fit well around the body. The present rating badges and other designations would afford sufficient decoration for good taste. He also proposes that the messman branch wear a distinctive uniform, because they form a distinctive class. The present uniform of stewards and cooks seems excellently adapted to their work, and, with small modifications, would be good for mess attendants too.

If the marines are taken from our ships, a uniform for the bluejackets that is less slouchy will become even more desirable than now. For, though marines are less useful on shipboard than an equal number of bluejackets, their uniforms give an air of neatness and trimness, which offsets, in a measure, the slouchiness of the bluejackets about the decks.

NAVAL TACTICS.

Naval tactics has been defined as the art of handling fleets in battle. But if this definition be accepted, it is apparent that "battle" must not be considered as limited to the time during which actual gun-fire is going on; but as embracing, in addition, all the time during which the fleets are maneuvering in each other's presence. In fact, during much of the time when gun-fire is going on, two things conspire to limit the employment of any

tactics whatever; one thing being the injury done to gun-fire by every change in the direction or speed of the ships; and the other thing being the prevalence of gun smoke, which, added to coal smoke, hinders the interchange of signals, and even an accurate idea on board any ship of what the other ships of both fleets are doing. So clearly is this true, that it is hard to imagine a condition in which a very effective gun-fire and tactical evolutions could be carried on at the same time.

The main effort of naval tactics, as employed by a commander-in-chief, may be said to be to place his fleet so, as regards the enemy's fleet, that his ships can use their guns and torpedoes more effectively than the enemy's ships can use their guns and torpedoes. This can be done in three ways:

(1) By so putting his fleet as regards the enemy that the sunlight will be in the eyes of the enemy's gunpointers and put his own ships in shadow, while the sunlight is behind his own gunpointers and illuminating the enemy. If a commander-in-chief can accomplish this near sunset or sunrise, with bright sunlight, he will have achieved a tactical advantage of the highest practical value.

(2) By so placing his fleet as regards the enemy and the direction of the sea, that his ships roll less than the enemy's ships.

(3) By so placing his fleet as regards the enemy that a greater proportion of his guns and torpedoes than of the enemy's guns and torpedoes can fire effectively.

Of these three ways, the third is the one that has received the most attention; and justly so, from the fact that the first way is not of much importance unless the sun be low and bright; and the second is not of much importance, unless the sea be such as to cause much more rolling when ships are heading in one direction than when they are heading in another—an infrequent case in ordinary weather, at least with battleships. Nevertheless, the first point has an importance which the writer believes underestimated, especially when viewed from the standpoint of speed; because it shows how the faster fleet, on the open sea, may maintain a position out of range until near sunset, and then attack with almost certainty of success. Let any one who doubts, turn a telescope sight in the direction of the sun when it is bright and an hour above the horizon, or even more, and see how utterly impossible it would be to do good shooting.

The third way, that of placing the fleet so that its gun-fire will be denser than the enemy's, has received so much attention that it would be impossible in the short space available in this paper, to say anything new about it. It amounts, in some cases to flanking, to getting the line of bearing of the enemy's fleet on the beam of one's own fleet, or to approaching this condition; but in other cases, it amounts to attacking one part of the enemy's fleet with a superior force, while the rest of the enemy's fleet is so far away, or so placed, as to be unable to support the part attacked.

Concentration plus Isolation.—It may be pointed out here that, as demonstrated in the prize essay of 1905, this is not exactly the same thing as concentration, because it is concentration plus isolation; in fact that concentration is of no value, unless accompanied by isolation; because without isolation, the concentration cannot be directed against an unsupported part. An exception to this statement exists when the value of some special vessel of the enemy, (such as a flagship), or her closeness to a ship astern, renders concentration on her desirable; and the writer has been unable to find a single instance in the naval battles of the past, when concentration without isolation was effective, except when directed against a flagship.

This does not lessen the importance of *ability to concentrate;* because, *although concentration can be employed without isolation, isolation cannot be employed without concentration.*

The distinction between concentration and concentration plus isolation has not been recognized (unless recently) even by our War College, as Professor Alger showed in his comment on Lieutenant-Commander Niblack's essay, "The Elements of Fleet Tactics." And it is extremely important that it be recognized; because, unless it be recognized, an admiral may risk a good deal to attain concentration on part of the enemy's fleet, when its attainment would do no good. Not only would he risk something for nothing, but he would impair his gun-fire by attacking inferior targets. Besides, he would complicate his fleet management by additional signals, which is admitted to be disadvantageous; and after the concentration had once begun, he might not be able to stop it exactly when he wished. In this case, the concentration would be kept up too long, and he would violate a "Principle of Warfare" recognized the world over, that "there is no use killing a man after he's dead."

The writer is aware that there is a widespread sentiment in favor of concentration, even without isolation; but he can find no written reason for it, except on page 439 of Mahan's "Influence of Sea Power upon History"; where, after describing the second battle between Hughes and Suffren, the distinguished author writes: "The practical advantage gained by the French must also be tested by comparing the lists of casualities, and the injuries secured by their individual ships; for it is evident that, if both squadrons received the same total amount of injury, but that, with the English, it fell on two ships, so that they could not be ready for action for a month or more, while with the French, the damage was divided among twelve, allowing them to be ready in a few days, the victory, tactically and strategically, would rest with the latter." And in a footnote he adds, "This remark seems too self-evident to need emphasis; yet it may be questioned whether naval men generally carry it in their stock of axioms."

The writer respectfully admits that the truth of this remark does not seem self-evident to him, and that he does not see why naval officers should carry it in their stock of axioms. Why are twelve ships, each one of which is injured, say by one-sixth of her original strength, necessarily better than twelve similar ships two of which are disabled utterly, and ten of which are entirely uninjured? They seem to be exactly equal, in fact, in the absence of evidence to the contrary, we should have to consider them so. It is probable that, *under some conditions*, the twelve partially injured ships would be better than the ten uninjured ships; but it seems equally probable that, *under other conditions*, the ten uninjured ships would be better than the twelve partially injured ships. For the reason that it is best to put a given amount of fighting power in as few ships as possible, the advantage would seem to rest, *under most conditions* with the ten uninjured ships.

Besides, although the wooden sailing ships of Suffren's days could be repaired after battle by their own crews, as was done, things are different now. If two fleets now receive injuries in any fight, at all comparable to the fight described, they would not get into shape again, without going to some sort of navy yard. And it would take fully as long there to repair twelve partially injured ships as two utterly disabled ships—*supposing the total damage in the two cases to be equal, as stated.* Meanwhile the ten uninjured ships would be carrying on the war!

Gun-Fire and Torpedo Fire.—One important effort of the commander-in-chief, which must be carried on under gun-fire, is to keep his ships so arranged relatively to each other, that no ship will mask the fire of another; and heading in such directions relatively to the enemy, that they will be able to fire their entire broadsides. A similar effort will be to compel, or induce, the enemy to huddle his ships, so as to mask the fire of some ships, and to head them in such directions, that they will not be able to fire their entire broadsides.

How to accomplish this must depend on the circumstances of each situation. But it is clear that, if either fleet has the advantage of bow or stern fire over the other, it will be its game to get well forward or abaft the beam of the enemy.

The recent improvement in the range and speed of the auto-torpedo forecasts its entrance into practical tactics; and that navy is wise which foresees its influence, and arranges its plans accordingly. At present, all we seem to be able to declare safely is that the auto-torpedo will soon make us do our gun fighting beyond 4000 yards; and that it will give the fleet of the greater speed the advantage that, by drawing ahead, it can reach the slower fleet with its torpedoes, when the slower fleet cannot reach it.

Attacking Colliers.—In the case of two fleets meeting, one of which is far from its base, and accompanied by auxiliaries, it might be the game of the other fleet to destroy his colliers; or, failing in this, abstain from battle, and prevent him from coaling. The enormous advantage of fighting near one's own base is suggested here; and the enormous difficulties of "carrying the war into Africa," if Africa is near the enemy's base.

Speed.—As the very idea of tactics includes the idea of movement, and, as the contest between two fleets for tactical advantage partakes largely of the character of a race, or a number of races, for a position of advantage, it follows that speed, from its very nature, is the most important single factor in naval tactics. Speed, as used in this sense, means speed of movement, not only in a straight line, but in turning.

Were it not for one fact, it would be hard to decide whether speed in a straight line, or speed of turning is the more important: but because of the fact that ships must spend more time in battle in following a straight course than in turning, we see that speed in a straight line is the more important. Speed of turning, how-

ever, is more important than may seem at first thought; for quickness in turning not only hastens the instant when a desired formation or position is attained, and permits the admiral to utilize that formation or position, but it lessens the injury to gun-fire while turning, by lessening the time consumed in turning.

Restricting our meaning of the word "speed" to the meaning ordinarily given to it, the writer wishes to make it clear that his declaration that speed is the most important factor in *tactics* is not intended to mean that it is the most important factor in *battle*. Other factors than tactics enter into a naval battle, the most important being gun-fire and armor.

Naval tactics may be regarded from two standpoints:

1. The broad professional standpoint, from which one considers all the factors which concern the tactical handling of fleets, and decides on the best designs of ships, and the best scheme of fleet handling. This may be called the strategical view of tactics. This view has already been considered in this paper—briefly, but as fully as the space seemed to permit.

2. The standpoint of the commander-in-chief, when actually handling his fleet in the presence of the enemy.

This is the strictly tactical standpoint of the subject of tactics. To consider it correctly, one must imagine himself the commander-in-chief of a fleet. He must see in his mind's eye a broad expanse of water, limited by the wide circle of the horizon, and perhaps land and perhaps no land. He must see his own ships—battleships, armored cruisers, protected cruisers, scouts, destroyers, and auxiliaries. He must see the like ships of the enemy. He must realize the responsibility. He must realize the struggle for position—the silent heart-breaking struggle; the enormous tension unrelieved by any opportunity for action, or vent for feeling. He must feel the situation, and say "what should I do then"? He must take account of his chance of seeing clearly the panorama of the battle, before and after the gun-fire has begun, when coal smoke and gun smoke are obscuring things. He must remember that conning towers are so made, that all the captains must either surrender what little chance they have of seeing, or else stand a very good chance of being disabled shortly after gun-fire has begun. He must not forget that, in all the ships of both sides, the numerous signalmen, quartermasters, and junior officers, whom the captains are accustomed to employ are in absolutely unpro-

tected positions, suggesting a generous use of shrapnel by the enemy, and a resulting demoralization in the handling of both fleets shortly thereafter. He must not shut his eyes to the fact that the people on whom he and all his captains have to rely for controlling the gun-fire, are about to be called upon to exercise an extreme nicety of judgment, *while under fire, in estimating, not measuring, the sizes of angles less than half a minute,* between the irregular water-line of the target ship and the irregular surface of the sea, where the splashes are seen; he must remember that they expose considerable targets, and may be directly attacked by shrapnel, and that shrapnel fire is very effective at 6000 yards; so that he cannot count on maintaining fire control very long after the enemy has begun to fire at him. He must remember that, in both fleets, the smaller guns are in positions imperfectly protected, thus making it obligatory for him to decide whether, inasmuch as he has those guns and men, he shall, or shall not, expose their crews to slaughter, for the sake of attacking by salvos the exposed officers, quartermasters, signalmen, fire-control party, and guns crews of the enemy. He must bear in mind that the ships will be obscured by coal smoke in addition to the gun smoke; and that it will be difficult, not only to read signals, but to measure distances, and sometimes even to tell one ship from another. He must remember that the only place from which an admiral can get an unobstructed view is the main truck, which is somewhat inconvenient; and that in any position, such as the bridge, where custom asks an admiral to die for his country, he will have an excellent chance for dying, but a very bad one for seeing. He must bear in mind that a great change will occur when the fleets get drawn up in within gun range, and gun-fire begins. Before that time, all will be order and quiet and precision. Nothing but a denser coal smoke, and a greater speed will make the occasion look very different from any tactical drill; but just before the clash, during the struggle for tactical advantage, the nerve tension will be more painful than anything short of actual wounds in the subsequent battle. Yet, so long as this period lasts, there will always remain the chance of achieving some great advantage, or averting threatened disaster, by some happy tactical maneuver; or of having the enemy make some mistake.

The naval battles of the Spanish-American and Russo-Japanese wars seem to show that, with battleships, after the battle is once

joined, tactics will step into the background, and make way for guns and armor. In the days before the gun became so destructive, when ships could not be injured by one shot so much as ships can be injured now; when the torpedo did not exist, and when men were just the same as now, fleets would fight together for hours, if well-matched, and sometimes for a whole day. The Battle of the Four Days was, strictly speaking, a battle that was fought, and fought hard, for four whole days.

But, despite the fact that armor has kept pace with ordnance, ships have not kept pace with ordnance; because they are not entirely covered with armor, and have no protection at all against torpedoes; while the directing personnel of a ship are as much exposed as in the days of Ruyter. The net result is that the proudest battleship which floats cannot fight nearly so long as the ships of Ruyter; and that the disablement of one or both fleets as directible, coherent forces, will probably occur much sooner after gun-fire has begun than in the days of Ruyter.

Maneuvering before Closing.—The idea that modern fleets may maneuver a considerable time in each other's presence, before taking the irrevocable step of closing, may not be accepted by some; and so it may be well to mention some battles that were preceded by considerable maneuvering, even in former days, when the consequences of an error were not so hard to overcome as they would be to-day, and when there was, therefore, less demand for caution.

Ruyter maneuvered from one day until the next, in order to get the weather gage at the Battle of the Texel. The entire day before the Battle of Stromboli was spent in maneuvering. Before the actual Battle of Beachy Head, the hostile fleets maneuvered in each other's presence for ten days. De Guichen and Rodney maneuvered for an entire day before the battle of August 17, 1780. The first battle between Hughes and Suffren was preceded by two days' maneuvering. Their fleets maneuvered in each other's presence twenty-four hours before their third battle. Hood and De Grasse maneuvered during the entire days of June 24 and 25, of 1782, ending with a short and inconclusive exchange of shots. The battle between Rodney and De Grasse of April 12, 1782, was preceded by an artillery duel on April 9, and by maneuvering by both fleets in each other's presence on April 10 and 11; and the Battle of the First of June was preceded by maneuvers during May 28, 29, 30, and 31.

In most of the battles which were not preceded by maneuvering, the reason was that one admiral found matters just as he wished, and was permitted to seize the occasion. This was clearly the case when Jervis sighted the straggling Spanish fleet, near Cape Vincent, trying to flee to Cadiz; when Nelson caught the French fleet helpless at anchor and in confusion in Aboukir Bay; when he saw the allied French and Spanish fleet, stretched out in irregular column to leeward at Trafalgar; when Tegetthoff caught the Italians utterly unprepared at Lissa; when Dewey found the Spaniards at anchor and unsupported at Manila; when Sampson discovered the Spanish fleet rushing into his arms at Santiago; when Togo saw the Russians advancing to destruction in Tsushima Straits. In some of these cases the fleet caught at a disadvantage was doomed before the battle began; in others, say at Trafalgar, skillful maneuvering might have saved the day. But in almost every case, where the fleets were fairly matched and both fought well, a great deal of maneuvering preceded the actual fighting.

If this were the case in the past, would it not be so now? The greater speed of modern ships might possibly shorten the time spent in maneuvering for position, but it might prolong it.

The Tactical Interval.—Our would-be tactician must therefore realize that the time during which tactics rules is only the interval elapsing between the instant when the hostile fleets come within each other's presence and the time when they come to blows. Nearly everything that tactics can do must be done within that time. Now, he must realize not only this, but also that the opposing admiral will also realize it. This will carry with it the realization that the admiral who sees himself caught in the inferior position will try to prolong the tactical interval, while the other admiral will seek to shorten it; one will try to gain time by tactical maneuvers, which will get him out of an inferior position, and the other will try to close.

If this line of reasoning be correct, we may say that naval tactics may be divided into three parts:

1. The struggle for the better position.
2. The struggle to get out of an inferior position.
3. The struggle to prevent an enemy from getting out of an inferior position.

This presupposes, of course, fleets of nearly equal strength. If they are not, the more powerful fleet would naturally try to force the fighting, unless some peculiar conditions, such as the strength and direction of the sunshine, or the relative coal supply gave the weaker fleet some tactical advantage so great as to offset, in a measure, the inferiority of strength. It also presupposes that both admirals recognize the conditions.

1. *The Struggle for the Better Position.*—If the fleets meet on the open sea, the struggle can hardly be decided otherwise than by speed. And as there will probably not be very much difference in speed, the struggle may last a long while, especially if one admiral knows that his coal supply is better than the enemy's; because, if he can defer the action until the enemy's coal is burned up, the enemy will have to surrender, *toute de suite*. This suggests the ridiculous possibility of two fleets burning up all their coal before fighting, because the admiral of each fleet had been led to believe the other fleet short of coal.

Leaving out any such contingency, we may assume that each admiral will realize that the die will be cast irrevocably when the two fleets once get engaged; and for that reason will exert every possible effort to get the best position, and not try to close until he feels that he has gotten a position, relative to the enemy's, as good as he can expect to get. On the open sea, it is hard to suppose that either fleet will have an advantage when they first sight each other, that cannot readily be overcome by the other fleet, which will have so much space and time for maneuvering; except an advantage which concerns the direction of the sea and the sunlight. If, for instance, two fleets sight each other at early daylight in clear weather, and the A fleet is just sunward of the B fleet, it would be A's game to close as rapidly as possible, and come to blows, at the time when the bright and level rays of the sun would blind the enemy's gunpointers; and it would equally be B's game to avoid action until the sun was higher.

Colored Glasses on Telescope Sights?—This line of thought suggests the possible advisability of putting colored glasses on our telescope sights, like the colored glasses on sextants, for use when looking into a steady glare sunward.

The Windward Position.—The direction of the wind and sea regarding the relative directions of the two fleets when first sighting each other, seems less important; yet it cannot be denied

that even a considerable inferiority in gun power might be overcome by a faster fleet, able to keep the slower fleet to leeward; especially in a high wind and rain, when accurate firing to windward would be impossible.

The Race.—If the strength of the sunlight, and the heaviness of the sea were too slight to make them important, each fleet would naturally tend to draw itself up in the best formation for giving or receiving attack; that is column, head to sea. Naturally, they would gradually close in somewhat, on more or less converging courses. Then would begin the struggle for position—the awful race for advantage; unless one admiral, or the other, knew that his speed was the less, and his guns and armor the heavier; in which case, (Vide Togo and Rojesvensky), he would naturally desire to close at once to gun range, and decide the battle by a stand-up fight.

But if the admirals did not know at first the relative speeds of their fleets, the fact would soon be decided by the race. A race somewhat like that here supposed is the race between the Russian and Japanese ships on August 10, 1904, a race lasting from about half-past two until about half-past five. During the race, gunfire seems to have been used a little, but so little, and at such great ranges as to have been a waste of ammunition, and irrelevant to the matter in hand or the result. About 5.30, however, the gunfire began, when the fleets had gotten within about 7500 yards. There was no real maneuvering whatever for battle positions; but the reason was that the mission of the Japanese fleet was, not to whip the Russian fleet, but to prevent it from going to Vladivostock; and the mission of the Russian fleet was, not to whip the Japanese fleet, but to force its way on the course then held, straight to Vladivostock.

It seems safe to assume, therefore, that after a race not very long, the fact that, say the A fleet has the superior speed, will be known to each admiral, and that each will form his plans accordingly. The A admiral will feel that he has the best of it, so far: and the B admiral will gird up his loins, and try by dint of skillful maneuvering to make up for this tactical handicap; hoping that some oiler in the A fleet will let a bearing get hot, and turn the handicap the other way.

2 and 3.—Recognizing the situation, the A admiral would probably head in a little, hoping to assume a line of bearing at an angle

to B's, his ships somewhat in advance of B, which would enable him to concentrate on B's leader, refusing his own rear and isolating B's rear; besides using his long-range torpedoes more advantageously than B. B might not object to A's closing, but he would object strenuously to A's getting ahead, and at an angle to his column; and to offset it, would have to turn away from A slightly. If A were to follow, the two fleets would take up circular courses on parallel arcs.

Small Gunnery Advantage in Attacking Leader, unless it is a Flagship, or unless Enemy's Fleet is in Close Formation.—But, unless the faster fleet can get far enough ahead to cap or T, there seems little advantage, *so far as gunnery is concerned,* in getting ahead at all in column parallel to the enemy's, except in the improbable case of the leader of the slower fleet being a flagship; because, although the faster fleet can concentrate on the leader, there is little advantage in concentrating on the leader, simply because it is the leader. The rest of the enemy's column would undoubtedly be subjected to some danger of confusion, if its leader were disabled; but little more so than if any other ship were disabled, except the rear ship.

This presupposes, of course, that the enemy's fleet is not in close formation. *If it were,* the sudden disabling of the leader might, in the smoke, cause collisions along the entire column, and sink several ships.

Attacking the Morâle of the Admiral.—In fact, unless the faster fleet can get far enough ahead to cap, or approximate it, it would seem best for it to take up such a position that its center ship would be opposite—not necessarily the leader, but the flagship of the enemy. And not only for the sake of the chance of disabling the flagship, and of killing the admiral and his staff, but for the certainty of impairing in some measure the morâle of the admiral himself. In operations on land, the beneficial effect of surprising and bewildering the mind of the opposing general, upsetting, if possible, his mental equilibrium, is recognized in the clearest way. And what could tend more to impair that cool, clear judgment, that ability to balance nicely the many quantities that must be balanced nicely, in order to make a wise decision on a momentous matter,—than to be surrounded by smoke too thick to be seen through, the ears assailed with the tremendous and frequent discharge of guns, and then suddenly to find one's ship

the center of a vicious assault from several battleships; to hear the explosion of shells against armor, and to see the flame, and hear the noise, and feel the shock of explosions; and to be suddenly confronted—not only with the probability of sudden death on an exposed bridge,—but, even if that does not occur, with the probability of having his flagship disabled, and seeing the rest of the fleet rush by, like a riderless horse?

The Unexpected must be Expected.—On the open sea, it seems somewhat improbable that either fleet would be able to T the other, unless some ship of one fleet slowed down, and the rest of that fleet slowed down a great deal, to keep her company. Of course, if one fleet can T the other, she will have such a gunnery advantage that only some unexpected happening can save the fleet that is T'd. Unexpected happenings, however, are part of the history of war and must be expected. See, for instance, the case of the *Mikasa* and the *Czarevitch* on August 10; both were hit in nearly the same place at the same time by 12-inch shells; but the shell that hit the *Mikasa* did little permanent harm, while the shell that hit the *Czarevitch* killed the admiral and jammed the helm hard over, causing the *Czarevitch* to sheer out of column; a maneuver which caused immediate confusion among the ships, and gave the Japanese an opportunity to close in, and use their guns to the best advantage.

So, even when gotten into a bad position, the out-maneuvered fleet must try to maneuver out of it and hope for good luck. The maneuvers will consist, of course, in some form of chasing by one fleet, and of running away by the other fleet. In the days before gunnery became so forceful, accurate, and rapid as it is now, columns of British ships used to stand down towards the Frenchman's line, with the intention of breaking through, and concentrating on the rear or center, and the Frenchmen would usually fire for awhile, and then up helm, and re-form to leeward. The maneuver was sometimes successful for the attacker, though always attended with much damage received:—but the chasing and running away could hardly take that form to-day.

Battles Near Land.—It has been assumed thus far, in considering the tactics of two fleets, that they meet with plenty of sea room. This is very interesting, as presenting the tactical problem in its simplest form; and there are no reasons why naval battles should not be so fought in the future, as many have been so fought in the past.

But the proximity of the land may give such an advantage, especially if it be the native land of one of the fleets, that one fleet may be expected to court battle there, and the other to shun it. A better illustration of the way in which the native land may be to the advantage of one fleet, and of the way in which the full advantage may be taken by one side, without the other's being able to prevent it, cannot be found than the battle of the Sea of Japan. The Russian fleet was T'd before it began to fight; that is, its slower speed made it impossible for it to keep its course to Vladivostock, without being T'd by the faster fleet; and its destruction was as complete and as quick as could have been expected; but no more so. Even if the Russians had been as good gunners as the Japanese, and even if the personnel and material of both fleets had been equal, the tactical conditions under which the battle began made the success of the Russians a matter of improbability. The value of the land in this battle consisted in its forcing the Russians to go through a comparatively narrow body of water, flanked by hostile shores, so placed that the Russians, in order to effect their object, which was simply to go to Vladivostock, had to pass through it in a direction more or less axial: while the Japanese could await them in security, and then form straight across their path. A more formidable "lay in the land" can hardly be imagined.

Another illustration of how the lay of the land may be of advantage to one side is given by the battle of Santiago. The Spanish fleet had to come out of a narrow channel, in column, while the American fleet lay across the exit; so that the Spanish, like the Russians, were T'd before the battle began. As soon as they could, the Spanish headed away; but the American fleet had already gained the critical initial advantage; and the presence of the rocky coast of Cuba denied the Spanish ships any escape from the position in which they found themselves.

The Battle of Manila furnishes an astonishing illustration of how the land may give one side an enormous advantage, which that side may utterly ignore, to its own undoing. The Spanish fleet not only had all the advantage of a navy yard for all its repairs, and a battlefield known perfectly to itself, and unknown to the enemy, but it could have had the support of the batteries on the ramparts of Manila, *which had of themselves, an artillery power greater by far than that of all the American ships.* This ad-

vantage was thrown away; and the Spanish fleet, *anchored seven miles away from Manila, and isolated from its support,* was destroyed with the suddenness and completeness that the conditions of the fight exacted.

Naval Tactics, Considered as a Game.—The foregoing general reflections about naval tactics concern the relative acts of hostile fleets in each other's presence, but have not touched upon the ways in which those acts should be performed; they suggest the general purpose of the game, but do not tell how to make the moves.

In a fleet the commander-in-chief plays the game, and tells the captains to go "ships right," etc. Each captain is as much a "piece" in the hands of the player as a knight is on a chess board. That is, he would be, *if* the game of naval tactics were developed to the same degree as the game of chess.

But it is not. So little has it been developed, that the expression "system of naval tactics" means nothing at all. How can there be such a thing as a "system" of naval tactics, when the last naval battle, that was fought with enough approach to equality, in personnel and material, to give any chance for *tactical competition,* was the battle of the First of June in 1794, which was fought between fleets of little sailing ships, whose armament, armor, and motive power were utterly different from those of battleships to-day?

There are a great many chess clubs and whist clubs in which certain men have acquired tremendous skill; and each man has his own general "system" of playing. But these men have each played thousands of games; and what admiral ever commanded in a thousand battles? Nelson had independent command at Trafalgar and the Nile, and acted independently, though second in command, at Copenhagen and St. Vincent. Hughes had independent command in four battles, and Suffren in five. Perhaps some admiral had independent command in six fleet battles, but the writer does not now recall it.

Now a "system" is worked by rules. How can a system of naval tactics be worked by rules, when the conditions change year by year, and no two naval wars have been fought under conditions even approximately similar, since the almost changeless centuries of the sailing days? If some successor to Mr. Stockton would get up a real Great War Syndicate, under whose manage-

ment sea battles could be fought under conditions as well-defined as those of a baseball game, then we could formulate a "system" of naval tactics; but not till then.

Need for Great Caution in Drawing "Lessons" from Naval Battles.—It is true that we can make deductions from certain battles; but the trouble is that the data are so meagre, and the conditions so complicated, that the deductions are almost as likely to be wrong as right. The battle of Lissa led everybody to an exaggerated idea of the value of rams: our Civil War gave us an exaggerated idea of monitors; our war with Spain gave us too low an estimate of the value of turret guns; and perhaps the Russo-Japanese War led many to underestimate the torpedo and submarine. We are prone to jump at conclusions, from "practical experience," without examining all the conditions; we are prone to conclude, for instance, that torpedoes are useless, simply because obsolete torpedoes failed at some special time; and yet, none of us would conclude from two throws of a die that—say 5,—was more apt to turn up than any other number.

A "system" of *land* tactics seems much more within the possibilities, because a great many well-contested (and well-edited) land battles have been fought within recent years; because the conditions of land battles can be more readily simulated than the conditions of sea battles; and because the changes in weapons have been comparatively so small and so gradual, that there is less danger of error in applying the "lessons" of 1806 to the conditions of 1906.

Necessity for Studying the Game.—But, because no way seems open of devising a "system" is no reason for not studying the game and trying to see what situations are likely to come up, and what move should be made when a given situation does come up.

This is what is done in other games, in fact, every game consists in meeting situations with moves, or acts, of some kind. But to do this, the player must learn first what moves to make, and second how to make them. In naval tactics, at least at the present time in this country, we seem to have reversed this procedure: we seem to have learned how to make the moves, but not to have learned what moves to make.

In a recent number of the INSTITUTE, Admiral Goodrich expressed an idea quite like the foregoing, by saying "the tactics of formation are like the alphabet in writing, indispensable"; but

what is to determine a commander-in-chief to perform any particular maneuver, and how shall he carry out his intentions?

Necessity for Keeping Tactical Drills up to the Times.—Furthermore, we seem to have come to a standstill in the matter of the moves themselves. We have been working a good deal at tactical drills during the past twenty years; and although the deck officers have at times become very skillful in making the moves, the moves are the same as they were twenty years ago, though the ships and guns are very different. In other words, we have not adapted the moves to the changes in conditions which have occurred. It may be possible that the changes in conditions have been such as not to require any change in the moves. But this is a matter that we must be sure about; because, if the lessons of the past teach anything, they teach that failure to see that changes in tactics are needed, has always been a fruitful cause of disaster. Braddock's defeat was not due to lack of tactical drill, or courage, in his troops, but to the fact that Braddock did not adapt the tactics by which he managed his troops to the conditions which he met; though the tactics had been devised to fight highly-trained soldiers on the closely settled lands of Europe, and he had to fight Indians in a forest.

It was largely a blind adherence to old methods that defeated the Austrians before Napoleon in Italy; the same thing caused the awful slaughter of the French, moving in masses under the fire of the German artillery; and the same thing caused a like result in the British ranks, when shot at by the Boers, dispersed on the hill tops of South Africa. And a curious and significant phase of this matter, as shown in those wars, is that, if the tactics be not adapted to the conditions, the highest skill in following those tactics is of no avail. In fact, *the higher the skill, the greater the ill result.* It was the very perfection of the regularity of Braddock's lines that made them such excellent targets for the Indians; even if they had been drilled under European tactics, but had been insufficiently disciplined, and had broken ranks and hidden behind the trees, they would have made a better fight. And in the later European wars, the more compact the masses, the more perfect the lines and columns, the greater the slaughter, under the rapid and accurate fire of modern arms.

In sea battles the instances are fewer; largely because the number of sea battles has been fewer than the number of land battles,

and because the difficulty of getting accurate information about sea battles is greater than about land battles. But we know that the attacks in column made in so many battles, by the British against the French, usually met with a fair measure of success; and we also know that any attempt *now* to charge a column of battleships against a column of battleships drawn up perpendicular to the line of attack, would be disastrous to the attacker, despite his superior speed, protection, and gun power, as compared with those of Nelson's fleets, and despite the fact that the "principles of war are everlasting." The fact that the receiver of the attack has proportionately more gun power than the French had in Nelson's day, is the only reason why the principal method of attack of the galley period and a favorite method in Nelson's time, would be ridiculous to-day.

In other words, this change in tactics is due merely to a change in conditions. Similarly, the battle between ships and forts was once conducted on fairly equal terms. Even in our civil war, ships were not at a very great disadvantage. One fact came out so clearly that the writer has heard it enunciated as a "Principle of War" that "ships cannot silence forts, but can run by them." That this was not a principle, however, but a condition, will probably be admitted by every one who knows that the guns and armor of ships have improved no more than the guns and armor of forts: and that ships have no new devices by which they can overcome the advantage, in both gun-fire and protection, that has been given to forts by modern mortars, position finders, submarine mines, submarine boats and disappearing guns.

The answer may perhaps be made that our tactical drills are up to the times; that it is impossible to prepare beforehand to meet all situations; that the commander-in-chief, finding himself confronted with a hostile fleet, will simply use his common sense, and direct his fleet according to circumstances; that he will form his fleet in whatever formation the circumstances may dictate, and change the formation whenever it becomes desirable; also that our tactical drills are adequate to carry out whatever movements are required.

To this, one may answer, in rebuttal, that even if our tactical drills are up to the times, we must see that they are kept there. Even the absolute commander-in-chief of a fleet cannot tell whether his drills are really preparing his fleet for battle, under

modern conditions, unless he tests them in some way, nor can he get any experience himself, except as drillmaster. We must not content ourselves with asserting that our tactics are up to the times, and making someone prove that they are not. We, ourselves, must assure ourselves that they are up to the times.

The reason that Braddock was defeated was not because he knew that the tactics he was using were bad under the conditions, but because he had not assured himself that they were good.

Our Tactical Drills are not Abreast the Times.—One fact seems to show affirmatively, however, that our tactical drills are not up to the times. That fact is that, while there are only two uses for tactical drills; one use being to teach the admirals and captains how to manage the fleet and the ships *in battle,* and the other to develop weaknesses in the organization, drills, and material, in order that rectifications may be made,—our tactical drills are not directed to accomplish these results. The admiral tells the flag lieutenant to signal "ships right," when there is no advantage to be gained by their going to the right; and the various officers of the deck (*who would not be there in battle*), get excellent experience in ship handling, but of a kind that has little relation to a sea battle, because the conditions are not realistic. No attempt is made to simulate the enemy. No attempt is made to make allowance for the smoke of gun-fire or the shock of gun discharge, or to provide protection for the directing personnel, or to minimize the number necessarily exposed, or to simulate the disablement of certain ships, especially the flagship:—and yet these are things which would come startlingly to the front in any well-contested battle.

How to Learn the Game.—So it would seem that our tactical drills are not realistic enough to give the captains much valuable experience in making moves in battle, or the admiral any experience at all in ordering what moves shall be made. If this be so, we do not compare very well with the commonest football team; and it is time that we learn our game.

Now, how shall we learn it? Shall we do it by mathematical calculations, by drawing diagrams and writing essays? This must be done, of course; in fact, a great deal of it has been done, and usefully. But the trouble is the same as is with all theoretical work; it needs to be supplemented by data, and data can be obtained only by practical experiments. Not only must theoretical

work be *supplemented* by data, it must also be *preceded* by data, before we can even determine the lines along which the theorizing should be directed.

Our poor human brains always seem to stumble along as follows:—first, experience suggests the advisability of meeting some contingency; then the brain gets to work and devises a theoretical means for meeting the contingency; then practice tries the theoretical means, and finally embodies it in some practical form. For instance, a man feels cold; theory suggests covering the body; the man makes clothes.

Following this idea, how shall we learn the game of tactics?

1. Practice squadrons in maneuvers against each other, under conditions as nearly like war as practicable, in order to see what contingencies must be met.

2. Devise theoretical schemes for meeting those contingencies.

3. Try those schemes practically.

Then will follow the same succession of events as has always followed in the history of human progress; a continual finding out in practice of difficulties, then a continual theoretical devising of means to overcome them, followed by a continual trial of those means, etc., etc. When that succession ceases, progress ceases.

This does not mean that two squadrons should be set against each other and left to their own devices. The mutual maneuvering would be a series of experiments; and nothing is more blind, expensive, and inconclusive than experiments which are carried on unscientifically. Experiments, to gain successful results, always have to be directed along a definite line of investigation. It is true that unexpected facts are often brought out by experiments, even facts not along the prescribed line of investigation; and some of the most valuable discoveries in science have been made by accident in this way. But these have always been accepted as free gifts; and they have been so few that it would be foolish to expect others, or to go in blind search after them.

The introduction of competition into our tactics will not increase the work of the subordinate officers or the men appreciably, for the same reason that a man does no more work in walking to a given place than if he walked the same distance aimlessly; but it will increase the work of the admirals tremendously. In fact, the position of flag officer, especially of commander-in-chief, in

time of peace, cannot fail to take on a character entirely new; and become one of great strenuousness, difficulty, and responsibility.

The Question of Risk.—The tactical drills of battleships are attended with risk, and it is probable that the introduction of competition will increase the risk, in the same way that the introduction of competition into our target practice has increased the risk of target practice. Eagerness to excel blunts the edge of prudence.

For this reason, the question of risk must be considered carefully, and the boundary line between a justifiable risk and unjustifiable risk, drawn as clearly as it possibly can be done.

But it will be very much easier to draw it clearly than to decide where it shall be drawn. And before this can be done, we shall have to decide what is a justifiable risk and what is an unjustifiable risk.

This subject would need a book for its proper exposition; so the writer will not attempt to do more than suggest a few phases of the subject, as it appears to him.

It appears to him that all risks are of themselves disadvantageous; that the only thing which makes a risk justifiable is something outside the risk; for instance, a practical advantage that will probably be gained if the risk be taken. If this be so, the burden of proof to establish the justifiability of a risk is always on the man who takes it.

If this be so, not only must there be a practical advantage to be gained by taking each risk, but the advantage must be commensurate with the risk. Not only this, but the advantage must be as definite as the risk.

Life insurance companies understand this. In fact, they understand the whole question of risk, and have even learned to deal mathematically with its phases as applied to their business. The enormous wealth attained by life insurance companies in recent years is proof of this assertion.

Successful men in commercial life must treat risk skillfully, in order to attain permanent success; for in business a man takes risks continually. Every shopkeeper takes a risk, when he lays in a stock of anything.

The speculator differs from the ordinary business man, in taking greater risks, but he takes them for the sake of greater

profits. As a necessary result of their methods, we see a greater measure of substantial prosperity among business men; but we find greater fortunes—and failures—made by speculators.

We also see another thing; we see that some men are able to take risks more successfully than others. Perhaps the best example of the successful risk-taker was Jay Gould. So enormous were the risks he took, that nearly every one expected that his "luck" would fail some day, and Jay Gould die poor. But he did not depend on luck. He understood the game thoroughly, and trained his judgment to tell him what risks were good, and what were bad.

But even this would not have availed, if he had not had the nerve to take the risks which his judgment told him were good.

This, then, was the combination that made Jay Gould successful:

First, complete understanding of the game,

Second, a trained judgment as to the risks and gains involved,

Third, nerve to follow the advice his judgment gave him.

If any one of these three factors had been wanting in Jay Gould, Jay Gould would have been like other men.

It is impossible to say which of these three factors was the most potent in Gould's success, and which is probably, therefore, the most potent in all cases of success. But it is very easy to see from daily life which of these three factors is the most potent in disaster. Probably any man who thinks about the matter for a minute will declare that *the most potent cause of disaster is nerve, when unaccompanied by understanding and judgment.*

Applying this line of thought to the matter of taking risks in tactical drills, and bearing in mind the fact that a disaster to a ship in peace is not only a definite practical loss at the time, but may mean the lessening of the fleet by one ship in a future war, we may conclude that—

1. No risk whatever should be taken, unless the justification for it can be clearly proved.

2. Inasmuch as all officers must get experience in tactical drills, and as all tactical drills contain some risk, the necessity for the experience constitutes the justification for all necessary risk involved, but not for any unnecessary risk.

3. Inasmuch as the risk in performing tactical drills decreases with the skill attained, the endeavor must be made to train offi-

cers; but the training must be gradual, and the difficulty of the maneuvers attempted should always maintain a proper relation to the skill of the officers attempting them.

4. Maneuvers which are dangerous should not be attempted, unless it can be shown that they would be useful in war.

5. All maneuvers, and all ways of performing maneuvers, which are merely showy are unjustifiable.

6. If one commander-in-chief has a temperament like the speculator's, and another has a temperament like that of the successful man of business, we may expect the former to do more brilliant things than the latter, but with a greater probability of ultimate disaster. The former will get the more personal glory; the latter will do the more good to this country. Napoleon and Wellington illustrate the types.

Attention may here be asked to the fact that a great deal of danger in naval and military operations is due to ambiguous orders and instructions. This suggests that every officer should be careful to see not only that his orders express his meaning, but also that they cannot possibly be understood to express any other meaning.

The Question of Distance.—Closely associated with the question of risk is the question of distance. Some officers believe that 400 yards between centers is too great and insist on 300 or even less. The gain in concentratability is obvious, and there can be no doubt that the distance should be made as short as is consistent with reasonable safety. But it should be borne in mind that,—

1. There is no use in drilling at a less distance than we shall use in battle.

2. In battle, the danger in steaming at a short distance is greater than at drill; because the gun smoke and coal smoke make seeing more difficult, the helmsmen and the men at the throttle and reversing gear below are more apt to make mistakes in all the ships, the noise on deck and the intense strain cloud the minds of the captains to some degree, and injury to the captains or the helmsmen may occur. In other words, the conditions of safe steaming are more difficult.

3. No matter what distance may be prescribed, ships are as apt to be closer than this as farther away.

4. When a ship puts her helm over, she throws her stern across the bow of the ship astern.

5. There is some distance so small that, with two given ships with a given speed, if the ship ahead puts her helm hard over, or if she becomes disabled, the ship astern cannot possibly avoid colliding with her.

6. The distance used in battle should be great enough to avoid the probability of any two ships getting within this *dangerous distance.*

7. *If any two ships get within this dangerous distance, the game of the enemy should be to concentrate on the leading ship of the two,* with the object of disabling her, and causing a collision.

8. Even if serious disasters did not then occur, buckling up could not be avoided. This would slacken the gun-fire, and bring about a state of confusion that would probably continue a long while. Unless the enemy's fleet got into a like condition, defeat could hardly be averted.

It seems clear, therefore, that one of the first things to be decided is the minimum distance, not at which ships can steam in column, but at which they can maneuver from column; this distance being such that, if one ship puts her helm hard over, or if she suddenly becomes disabled, the ship astern will not collide with her. After this has been determined, it will then be necessary to determine what distance shall be added to this as a factor of safety, to get the minimum distance which it is reasonably safe to prescribe between ships in column in battle; in recognition of the fact that some ships will surely get closer than is ordered.

If 400 yards be the prescribed distance between centers, we must allow at least 167 yards, the length of the *Colorado,* as the length of a unit ship; which gives the distance of about 233 yards as the distance from the stern of one ship to the stem of the next. It is well known that this distance is safe. The question is, can we wisely shorten it; and if so, how much?

Of course, we can shorten it 100 yards, and the ships can still maneuver in safety, *so long as this distance is not actually decreased.* But in the unavoidable smoke and confusion of battle, this distance will actually be decreased. Even when steaming under the easiest conditions, and at 400 yards, the ram of one ship sometimes gets abreast of the stern of the one ahead of her. If a maneuver became necessary at such a time, and the ship ahead put her helm hard over, either to port or starboard, or if she sud-

denly became disabled from some cause, such as a large wound near the water-line, a collision could not be averted; and such a collision in battle would probably entail defeat.

While realizing to the fullest the advantage of the concentratability given by short distance, the writer has been forced to the conclusion that, until we know exactly how a battleship will act when receiving a 12″ shell at the water-line, the question of determining the best battle distance should be approached with the greatest circumspection. We must remember that if the prescribed distance be too small, it will be not only the ship astern of the disabled ship, but also all the ships astern of her that will be affected. For instance, the captain of one ship, seeing the ship ahead of him slow down, or sheer to starboard or port suddenly, and *not being able to see clearly*, may slow down more than he ought to do; especially if he is closer than he was ordered to be, and is not able to sheer to either side himself. This would force the captain astern to slow or back, and so on; causing imminent danger of collision down the entire column; whereas, if the ships were opened out more, no danger would be entailed, beyond the sheering out of one ship. It may be objected that ships in column are not exactly one behind the other. To this the reply may be made that they are, when about to make a maneuver; and that this is exactly the time when collisions are most apt to happen.

It may be suggested here that the time required to get into "exact column" is so considerable, that an admiral in battle may prefer to keep his ships in exact column all the time, especially as this will permit a disabled ship to sheer either way; which may, in case of disablement of steering gear, be a very advantageous privilege.

This line of thought suggests the advisability of having an automatic helm indicator, and two automatic shaft indicators, over the stern of each ship, to show the ship astern where the helm is, and what each engine is doing. They could be secured just below the rail, and would not be at all liable to injury. The helm indicator might be a pointer, say three feet long, connected by sprocket chains to the helm, and move to starboard or port with the helm. The shaft indicators might be pointers, say two feet long, connected to the shaft by sprocket chains, so that they would revolve synchronously with the shafts.

It may be objected that a helm indicator is not needed, because the captain of the ship astern can see the ship ahead sheer, when the helm is put over. To this objection, one may reply that it takes a good many seconds after a battleship's helm is put over, for her to take a sheer that will be plainly apparent to the ship astern.

It may also be objected that shaft indicators are not needed, because the speed-cones show what the engines are doing. To this objection, one may answer that, even if speed-cones be used in battle, they will be extremely unreliable; first, because the speed-cone boys will be very apt to make mistakes and to forget to move the cones; and second, because the boys will be in the most dangerous place in the ship, and very apt to be hit by something and disabled.

The battleship torpedo has hardly yet entered into practical tactics, but we can see it coming; so it may be pointed out here that, although a small distance between ships gives the advantage of concentratability of gun-fire, it increases the chance of being hit by a torpedo. If ships are steaming at 400 yards distance, and their average length is 400 feet, the chance of some ship being hit by a given torpedo is 1 in 3, or 3 in 9; while if they are at 300 yards, the chance is 4 in 9. In other words, the chance of being hit varies inversely as the distance between the centers of the ships.

DUALITY OF THE NAVAL PROFESSION.

If one were called upon to say what is the distinguishing feature of modern civilization, as compared with ancient civilization, he might at first be puzzled to reply. Yet it is evident that modern civilization is different from ancient civilization. In what does the difference consist? It cannot be proved that we are any stronger, better, braver, or more beautiful than the people of Greece and Rome in their early days. Certainly we are no more patriotic. We have no greater writer than Plutarch; no greater philosopher than Plato; no greater orator than Demosthenes; no greater hero than St. Paul; no greater poet than Homer; no greater sculptor than Praxiteles; no greater statesman than Cæsar; no greater general than Alexander; no greater admiral than Themistocles.

And we cannot prove that our governments are any better administered, or that our society is on any higher plane than were the governments and the society of Greece and Rome, in the times before they became degenerate.

Yet there is some difference, and a tremendous one, between modern civilization and ancient civilization. What is it?

The Use of Mechanism.—Clearly the difference lies almost wholly in the use of mechanism. Of all the mechanisms, that of printing is, of course, the most important. We cannot even imagine modern civilization without it. But although printing is the most important of the mechanisms there are many others of an importance such that we can truly say that modern civilization could not exist without them. Of these the steam engine, the telegraph, and the sewing machine come first to mind. After them, and almost as important, come the telephone, the elevator and the trolley car; and after these come countless mechanisms of countless kinds. Our whole life is surrounded with what may be called an atmosphere of mechanism. One may walk a whole day in the city, and, excepting the sky, clouds, trees, earth and people, see not a thing that is not mechanism, or was not made by mechanism of some kind. And the use of mechanism is increasing every year. New inventions are born continually. Thirty-one thousand patents were taken out last year, and every year the number is increasing.

Prevalence of Mechanism in Navies.—In common with everything else, the naval profession has taken on the use of mechanism. In fact, there are no other people in the world so closely associated with mechanism as the people of the navies. Even the mechanical engineer goes home at night, or ought to do so; and Sunday he spends with his family, we may trust; but that he spends it in occupations as far removed as possible from those of his days of work, we may feel quite sure. On board a man-of-war, however, a man is not only surrounded day and night, Sundays as well as week days, by machinery, but he lives in a machine; for a warship is the greatest and most complex machine there is. And not only this, he is a part of the machine itself. No matter what station he occupies, he forms one moving part of the machine, with his place and use as fixed as those of any valve, and with a spare part on hand to be put in his place, if he becomes disabled.

Improvability of Mechanism Greater than that of Man.—Now, the greatest use of mechanism is in reinforcing and assisting human skill and strength. Human skill and strength have never been, and probably will never be, developed very high. The development of human skill and strength begins in childhood; and it cannot be said that, on the average, it continues more than thirty years. The limitations are obvious and rigid. The principal reason evidently is that every man's skill and strength die with him. No matter how strong and skilful a man may be, his son must begin just as his father began, just as weak, just as ignorant, just as clumsy. But a piece of mechanism, "lifeless" it is sometimes called, has an attribute denied to the human race—that of improvability. A mechanism, once invented and constructed, may live for ages, even though the parts composing it are broken and thrown away. Not only may it live for ages, but it can be improved upon; each improvement being a definite and enduring step up the hill that we call progress. History does not allow that man, as man, has improved very much, or that he has the capacity for doing so.

Best Illustration of Power of Mechanism is a Fleet of Battleships.—If we should search the world for an illustration of the way in which mechanism assists the skill and strength of man, the best illustration we should find would be a fleet of battleships. There is no man on earth who has his strength and skill reinforced and assisted so definitely and directly as does the admiral of a battle fleet. His own strength and skill, no matter what they may be, are subject to the limitations of poor human nature; but reinforced and assisted by the guns and the vis viva of sixteen battleships, he is a being, compared with whom the ancient conception of Jupiter with his thunderbolts was a pigmy.

If the strength of a fleet be doubled, the skill of the admiral remaining the same, it is clear that the power of the admiral will be doubled; also, if the skill of the admiral be doubled, the strength of the fleet remaining the same, it is clear that the power of the admiral will be doubled. We may, therefore, truly say that the power of an admiral commanding a fleet can be measured by the product of the strength of the fleet itself and his own skill.

It is clear, also, that what has just been said about the admiral is true of the captain of every ship; that the power of the captain of every ship is a product of the strength of that ship and his own

skill. It is also clear that a like thing may be said about every officer in the fleet, and every enlisted man; that the work each officer and man can do is the product of the tools put into his hand and the skill with which he uses them.

Personnel and Material.—Of course, this is only an extension of the well-known idea that every navy is divided into personnel and material. And, of course, it is idle to talk about which is the more important, because the net result is the product of the two. Fortunately, it is not necessary to decide which is the more important; because excellence in either is not gotten at the expense of excellence in the other. It may be contended by some—and it has been—that the personnel is the more important, for the reason that if the personnel be excellent, it will see to it that the material is excellent. While giving weight to this argument, it may be answered that the personnel of a modern navy cannot be even good, until it has had sufficient practice with the proper material; and furthermore that the record of all navies shows that improvements in material have not originated with the personnel of the navies, unpleasant as it is to remind ourselves of this fact. We will be safe, however, in saying that it is essential to the efficiency of any navy to have as good material as possible and as good a personnel. It is clear that the personnel will be good, when the various individuals composing it handle skillfully the tools placed in their hands under the conditions of service; and it is clear that the material will be good, when it is such as to yield good results, *when skillfully used under the conditions of service.*

Military and Technical Skill.—It is not necessary to think very deeply about the matter before seeing that the kind of skill required by the personnel naturally falls into the two classes, military and technical. It is also clear that no individual can do his work well, unless he does it well in both a military and a technical way. It is also clear that, although a sharp dividing line may be drawn between the military and the technical or engineering arts, yet, in the ordinary exercise of the naval profession under the conditions of service, this dividing line is blurred. In the ordinary exercise of the duties of a naval officer, his military and his technical work are so closely connected, that it is hard to tell where one begins and the other ends. Neither is it necessary to decide which of the two is more important; for any officer's efficiency is clearly the product of his military and his technical

efficiency. It is true that there are occasions under which, for a short time, the military or the technical part of his profession may be more prominent. But if such conditions exist for long, it is usually due to accidental cause, and can hardly be considered a normal case.

It may seem at first sight that, in some of the lower grades of the service, including those of both officers and enlisted men, the technical, or engineering, part would be more important, while the reverse would be the case in the higher grades; that a chief engineer or ordnance officer, for instance, would have more need for engineering knowledge than an admiral. Doubtless, this is true in a measure; but perhaps not to so great a degree as might be first supposed; for although an admiral should not be called upon to descend to small details of mechanism, neither should he be called upon to descend to small details of organization, or even of strategy or tactics. *All a man in a high position can do is to direct along the proper line the work of those below him;* and how can any admiral or captain be the best, who does not have a very clear comprehension of all the factors which compose his fighting force, mechanical as well as human?

It may be objected that, even if this be true, technical knowledge would come more into play with an admiral, or captain, in the years of peace than in the critical moment of battle. To this it may be replied that the years of peace are just as important as the critical moment of battle; because it is the work done in the years of peace which decides how the critical moment of battle shall be met; and this work must be done, not only by developing proper skill in the personnel, in using the various mechanisms, but also by seeing that the most up-to-date mechanisms are provided for the personnel to use.

Necessity for Keeping Mechanism Up-to-Date.—Surely, no argument is needed to prove that it is just as important to have up-to-date mechanisms as to have the personnel drilled to proper skill in using them. The writer will not assert that it is more important to have proper mechanisms than proper skill, because this might be misunderstood as belittling the necessity of skill; but the position can easily be maintained that mechanism has done much more to increase the power of a fleet than has the development of skill, simply because mechanism is capable of being carried to a higher point of excellence. The proof of this is

hardly necessary; for what could all the trained admirals and captains and fleets of Nelson's time do against one battleship, commanded by an ordinary man? What quartermaster of the utmost skill can compete in signalling with a second-class electrician, handling the wireless telegraph; and what gunner of twenty years ago could compete with an ordinary gunpointer of to-day, with a telescope sight and a balanced turret, electrically controlled? In 1891 a little girl eight years old, the daughter of a French officer, made a perfect shot at a target, from a turret, being simply told to press the button when she saw two lines come together.

"A Scientific Person and a Sailor."—Many years ago, Mr. W. L. Alden used to have a funny editorial in the New York *Times* every day. In one of these editorials occurred a sentence substantially as follows: "this story is inherently incredible, because it represents the hero as both a scientific person and a sailor: a combination almost unthinkable."

But, at the present day, the need for scientific training is so great, especially in certain branches of enginering, and an officer's duties are sometimes so purely of an engineering kind, that he *must* be "both a scientific person and a sailor"; and the line between the engineer and the naval officer is becoming very dim. The strictly naval profession has lost many of its distinguishing peculiarities, as have certain other professions. In fact, this gradual blurring of the outlines is common to many vocations, and is one of the most interesting facts of modern times, co-existing, as it curiously does, with the increase of specialization. The lawyer, not very long ago, stood out sharp and clear in his calling; but now there are so many kinds of lawyers, so many of them are in the employ of large business corporations, and so many business men have legal training, that it is hard to say just where the dividing line between the business man and the lawyer can be found. In some cases, the dividing line does not exist.

So with the naval officer. There was no difficulty fifty years ago in seeing a wide and deep dividing line between the naval officer and the engineer; but now, an officer's work may for a long time be so wholly connected with figures and metals, and blue prints, and machinery, that he may almost be pardoned if, unthinkingly, he may say in support of some contention, that primarily he is an engineer, and merely devoting his attainments to the navy.

For many years, a well-defined and recognized antagonism existed between the old-time naval officers and the engineers; but this is happily fading away. The reason for its existence is easy to find; it was simply the sudden forcing into a conservative profession of another profession, which was not only exceedingly progressive, but exceedingly aggressive. It is difficult for us to realize to-day the tremendous changes forced into the old-time profession, by the interjection of this turbulent element. And when we remember that it began only a little more than fifty years ago, when we contemplate the changes wrought, and the opposition encountered, we may wonder perhaps, that the changes came about with such comparative peacefulness. Certainly, no other profession has had an experience at all to be compared with it. It is true that the medical and electrical engineering professions have seen great changes; but these changes have been almost wholly in science and theory, and affect but little the daily lives of the practitioners; whereas in the navy, the changes have been, not only in science and theory, but to an amazing degree in the daily life of every man. The physician lives much as did the physician of fifty years ago; but what comparison can there be between the life of any man on board the *Saratoga* and the life of any man on board the *Maine?*

Resistance to Introduction of Mechanism.—For many years, not only was there a distinct antagonism between the individuals of the military branch, the line, and the engineers, but there was a distinct opposition on the part of the line to the adoption of engineering appliances, of mechanisms of all kinds. The history of the struggles and ultimate adoption of mechanical appliances, even of steam itself, is a history of which the navy need not feel proud. Many of the things on which we pride ourselves to-day, our engines, our turrets, our torpedoes, our gun mounts, our sailless ships, were opposed, not only with passive resistance, but with a bitterness that now seems inconceivable. But they are inconceivable now, simply because these particular appliances have forced their way into the service, and rejoice in a general popularity; and this must not blind us to the fact that their adoption was kept back many years, that the service is now less far advanced than it would have been otherwise; and that, despite this fact, the navy has thus far failed, and still fails, to appreciate the importance of encouraging new conceptions. It is willing to

have improvements in detail made in mechanisms whose value has been proved; but it cannot rise to the appreciation of an invention as distinguished from an improvement, or view improvements calmly, unless they are very gradual. A few exceptions may be made, such as the wireless telegraph and the stadimeter; but these were conveniences, which gave people less work and not more; and besides they were so simple, that no imagination or judgment was needed to decide about them.

Necessity for Stating Facts and Suggesting Remedy.—This may seem like a mere general complaint, unbased on actual facts; and even if based on actual facts, to be merely destructive criticism, which rails at an evil but suggests no remedy. It becomes necessary, therefore, either to withdraw the complaint, or else prove its justice; and then suggest a remedy.

A few facts will therefore be stated; numerous and important enough to show that, since they all, except the last one, came within the writer's own narrow experience, they could not have been exceptional cases, but must necessarily have been symptoms of a general condition. A remedy will be suggested later.

First Test of Telephones on Shipboard.—One instance was the treatment accorded the telephone. In 1890 the Bell Telephone Company, at the suggestion of a certain officer, asked permission to install two telephone circuits in the *Philadelphia*, then building at Cramp's yard. One circuit was to run from the executive officer's office to the master-at-arms', and to represent the easiest condition; the other circuit was to run from the bridge to the engine room, and to represent the most difficult condition. The company offered to do the work for nothing.

Permission was at length obtained, and the installation made. The circuit from the executive officer's office to the master-at-arms' worked well, and received a good report. The circuit from the bridge to the engine room did not work well, and received an unfavorable report, and was taken out of the ship. Why?

Because the insulation was chafed off between two short wires on the bridge. In order that the officer of the deck might be able to use the transmitter and receiver without stooping, or turning around, and in order to avoid a cumbrous pedestal, the support for the telephones consisted of a stand about three feet high, inside of which was an inner tube, carrying the telephones, which tube could be pulled up telescopically, until the telephones were

at the most convenient height. All wires of the circuit were permanently installed, except two flexible wires, perhaps two feet long, which connected the ends of the permanent wires inside the stand to the telephones which were raised or lowered, on the inner tube. The effect of the wind was, of course, to make these wires rub against each other and quickly destroy the insulation between them. It seems scarcely credible, but it is a fact that this trivial difficulty, so easily remedied, was sufficient to cause an inference and report exactly wrong as to the result of the test. This delayed the adaptation of the telephone to our use, and forfeited the assistance and interest of the only people in the country who then understood the telephone.

Telephone Installations in Our Ships.—The general telephone system in nearly all our ships is another case. Until within the last three years, when certain obvious causes combined to bring about a reform, the telephones in our ships were very much more inefficient than any the writer has ever used anywhere else. In fact, except on board ships in which the telephone installations have been made, or rectified, within the last three years, the telephones are so exasperatingly bad, that people seldom use them. Yet, the telephone is about the most perfect instrument in the world—the most valuable, the most easily kept in order.

It may be objected that "the telephone is not adapted to ship use." This has been direct and easy accusation against it, and in general, against all new mechanisms. The lack of truth of this accusation, as applied to the telephone, is proved by the excellence of the telephones which have been put in our ships recently. There is no reason, scientific or practical, why a telephone should not work as well on board ship as anywhere else. In fact, there was a perfectly efficient telephone system, connecting the forward and after instruments of the electric range finder, on board the *Baltimore* as far back as 1890 and 1891; and yet the entire circuit was exposed on the spar deck.

The Naval Telescope Sight.—The naval telescope sight furnishes another illustration of the navy's blindness to the value of new ideas, unless the demonstration of their usefulness can be made so clearly as not to require thinking. In September, 1892, the three gun divisions of the *Yorktown* fired six shots each, 18 in all, at a regulation target distant 1320 yards; and they made a total score of 52 out of a possible 90, using the ordinary gun

sights. A new invention, the present naval telescope sight, now used all over the world, was then fitted to the gun mount, and five shots were fired, the fourth breaking the target mast. The aggregate score was 22, out of a possible 25. The average score made with the open sights was therefore $\frac{52}{18} = 2.9$; and the average score made with the telescope sight was $\frac{22}{5} = 4.4$. This was 50 per cent better than had been done with the open sights, and yet the telescope sight had never been tried before, except once, when a mistake had been made in bore-sighting it. Not only this; but had the present target been used, four shots out of eighteen would have hit it with the ordinary sights, and four shots out of five with the telescope sight. The marking for the telescope sight shots was done with great care by Ensign B. F. Hutchison.

Nearly two years afterwards, on board the *San Francisco*, in May, 1894, the same sight, placed on a six-pounder, was tested for two days by a Board, with the result that, using the regulation target of that day, 1000 yards distant, the ship at anchor, twelve officers and men made an average of 94; and only three of these had ever used the sight before. The next day, eight men, selected because of their poor marksmanship, not one of whom had ever used the sight before, except one man who had fired one shot the day before, made an average of 81.8. One was a coxswain, one a seaman, one an apprentice boy, two landsmen, one a machinist, one a boilermaker, and one a coal passer. The marking and observing were done in both cases with exceptional care: and it is doubtful if the accuracy obtained on the first day in the *San Francisco*, has ever been surpassed with a six-pounder.

Now, did the navy applaud the invention, and put the laurel on the inventor's brow? They called the invention impracticable, and the inventor a "crank."

Not only this, but after the sight had finally been adopted, the reports from officers of all ranks about it were, in the main, so condemnatory that the Bureau of Ordnance, as late as 1902, was on the point of retiring it from the service, and acknowledging the invention a failure. The only thing that saved it was the clear head of Sims, who proved that the trouble was, not in the sight, but with the people who constructed the actual instruments, and the people who used them; the people who constructed the

actual instruments making them too flimsy, and the people who used them not securing them firmly in position. Sims accomplished this in 1904.

In other words, it took twelve years for the navy to apprehend the value of an extremely simple device, of extraordinary value, intimately connected with the very gist of the profession; though the most convincing demonstration possible had been made the second time that it was tried.

Omission of Submarine Torpedo Tubes.—Another surprising case was the striking out from the designs of the *Colorado* and certain other ships, of torpedo installations. Happily, the designs were subsequently rectified by the united efforts of a few officers; but the practical evil done has not even yet been rectified, because of the delay occasioned. Now, in this case, and in all others here mentioned, the cause was a blindness to the value of new ideas in mechanism which is almost incredible. In all these cases, the value of the mechanism stood as plain as the sun in a clear sky. In the matter of the torpedo, for instance, it was perfectly well known that our then new 5[m] torpedoes could run 1500 yards at 25 knots; that great lateral accuracy is not needed *in firing at a fleet;* that torpedoes were in favor in all European navies; that the invention of the Leavitt super-heater *had been made* which increased the speed and range enormously; and that experiments *already made* indicated that the turbine would much increase the simplicity and reliability of the weapon,—as has long since been proved.

Electric Turning System for Turrets.—A like blindness came almost infinitely close to losing for the navy the electric system by which our turrets are turned so well. Even after an absolutely complete demonstration of the superior control of electric power had been given at Schenectady in 1895, the apparatus used being identical in all respects, except minor details, with the apparatus since used in all our fighting ships, a Board of Officers, after testing it for two days, reported against it *in toto.* The suggestion was then made, by a certain officer, that two turrets of the *Brooklyn* be fitted with the electric system used in the demonstration at Schenectady, and two turrets fitted with whatever system the Department might present, so that the two systems might be tried under conditions identical in every way, and by the same officers. *This suggestion was rejected;* and steam turning ap-

paratus for all four of the *Brooklyn's* turrets were ordered. The few advocates of the electric system did not lose heart, however. Neither did their enemies. The result was a conflict that lasted many months; the issue being,—*not* the adoption or non-adoption of the electric system, but merely permission to *try* it, *after* electric motors had been used for years under cars, in snow and mud, all over the United States, and *after* the Schenectady demonstration had been made. The Secretary finally granted permission for the test. The result was a triumph so overwhelming that further obstruction became useless, and yet *to the mind of a man who understood the question,* not one thing was demonstrated on board the *Brooklyn* that had not been demonstrated with absolute conclusiveness at Schenectady.

The Case of Sims.—The case of Sims was a still better illustration of our ultra-conservatism; because the reforms which Sims proposed were so simple, the need of them so obvious, the resistance to them so determined, and the benefit now accruing from them so tremendous. Sims was not an ignorant crank, but a lieutenant-commander in the navy of excellent reputation. He proposed—not a fantastic, highly expensive and extremely scientific experiment, but simply that our navy improve its gunnery in the way a certain British squadron had improved its gunnery, by firing at cheap little moving targets, by securing the sights and other gear firmly, and by practicing at loading. Did the navy see? Not at all. Did any naval officer of high rank help Sims? Not one. Who did? A *civilian,* President Roosevelt. The writer does not believe that he ought to write what he thinks about this episode; but he feels that every naval officer ought to regret that we failed to manage a matter so clearly our own business, and that a reform of purely naval character, so simple and so good, should have had to be forced on us by a civilian.

Fulton's Torpedo.—No mention has been made thus far of the early struggles of the navy against the light. Its resistance to the introduction of nearly all the appliances that have made ships formidable and comfortable are perfectly well known, and are recorded faithfully in books. Recent instances only have been noted, in order to show that the spirit of resistance does not belong wholly to the distant past. One early instance may be recalled, however, because it typifies, with singular fidelity, not

only the whole series of battles fought between new ideas and the officers who happened to encounter them, but also the attitude of many other officers towards those officers.

The instance is the trial of Fulton's torpedo in 1810. Congress was much interested and appropriated $5000—a great sum in those days, for the test. The ship designated against which to make the test was the *Argus*, commanded by a captain whose name need not be given. Now the purpose of the test was perfectly plain to any fair-minded man. It was not to sink the *Argus*, or to glorify Fulton, or to humiliate the captain; it was simply to find out whether or not the torpedo was adaptable to the purposes of naval warfare. Did the captain give the invention a fair trial, such as would bring out its virtues, if it had any, and expose its defects, and show what defects were remediable, and what not remediable? Did the captain recognize the fact that, if this invention were good, it was his duty to bring out the fact, and report it, so that his government might profit? He did not. He acted as if his ship were threatened by a danger which it was his duty to avert; and he resorted to such extraordinary measures to avert it, that, while he succeeded in crushing the life out of the struggling little idea, for the time being, he drew from Fulton the wise, *but unheeded*, remark that "a system, then in its infancy, which compelled a hostile ship to guard herself by such extraordinary means, could not fail of becoming a most important mode of warfare."

This incident is clearly typical; and not only because of the action of the captain, but because the propriety of his action has ever since been debated seriously by naval officers! And yet, the recognized value of the torpedo to-day, was evident to many before 1810, *after* Fulton's many demonstrations; and it was almost evident even to a civilian Congress. How can it be doubted that the captain did the service an injury, which, though negative, was none the less actual and irreparable? An opportunity was then given to the young American navy to show a little enterprise, and to seize the practical advantages accruing from the sole possession of an important instrument of war. The only price was the exercise of an open mind. The opportunity was rejected; and opportunities once rejected, never come again.

Causes of Resistance to New Ideas.—Supposing that the facts

just brought forward prove that, in many ways, the navy has been unduly slow in adopting new ideas, it is now in order to suggest a remedy; but, before doing this, it may be well to see if the causes can be ascertained, as this may assist in finding the remedy.

If we try to find the causes of this resistance to new ideas in mechanism, three will soon suggest themselves:—

1. Failure on the part of officers in high position to realize the duality of the naval profession; to realize that a navy consists of both the personnel and the material; *the two of equal importance*, and each useless without the other.

2. Failure on the part of officers in general to correlate the military and the engineering arts; due to lack of knowledge by some officers of engineering matters, and to a lack of knowledge by other officers of military matters, combined with a lack of perception by both classes of officers of the relations which ought to exist between the two arts.

3. Simple lack of open mindedness on the part of officers in high position. This does not mean that naval officers as a class, lack the open mind more than people in civil life do; but it does mean that *we do not get an equal proportion of our able men in high positions;* and that, when we do get one in high position, he is beyond his prime, physically and mentally, besides not being so "up-to-date" as a younger man. This lack applies especially to engineering matters, which change so rapidly, that it is almost impossible for an elderly man to keep pace with their progress. Imagine a successful commercial organization, in which the men in high positions, not only averaged sixty years of age, but occupied those positions because they averaged sixty years of age.

The cause of these causes is not apparent; but the suggestion may be hazarded that a partial cause may be the fact that, while the main factors in controlling men are the hope of reward and the fear of punishment, naval officers are controlled almost wholly by the fear of punishment. Yet of these two factors, *the hope of reward is the more potent;* because the mind dwells on it longer than on the distressing fear of punishment, from which it naturally recoils; and from which it healthfully seeks distraction in more pleasant thoughts. An officer receives not even thanks for exerting initiative, unless under the direction of some superior, or for

doing any original work, even if that work prove of the highest possible value to the service. But he is punished, and sometimes severely, for an error that it required only 30 seconds to commit. This tends to make a man "play for safety," as a habit; and a man who "plays for safety" as a habit soon becomes an ultraconservative. In fact, this is what an ultraconservative is.

But whatever the cause, the impression is broadcast that naval officers, as a class, are ultraconservative, and are extraordinarily slow in apprehending new ideas, even after some one else has conceived them, and demonstrated their correctness. This quality is amazing to civilians accustomed to the greatest nimbleness in keeping up with the times; and it subjects naval officers to criticisms which are often unduly harsh. We are sometimes declared to be a class of men very brave, but unable to do anything but routine work; unable to get out of the rut cut for us by our superiors, and incapable of understanding the value of any new appliance, unless it makes a perfect demonstration before our eyes. It has been declared that, while all the world is progressing, and while progress even in the naval engineering arts is very great, almost no step in the progress of any naval engineering art has ever been originated by a naval officer.

Proposed Remedy.—Supposing that the instances cited prove that the navy has been unduly slow in adopting new ideas, and that the causes are fairly clear, we may now see if a remedy can be found.

The remedy is easy to find, because it has been found already by the large industrial concerns. These are themselves large organizations; and competition between them is so keen, that a concern which falls behind the times, goes into the hands of a receiver very soon. Fortunately for our navy, foreign navies have been as lax as we, and will continue to be so until one navy wakes up. Then they will all have to bestir themselves, or get into a condition so obviously inferior, that fighting would be a useless sacrifice of life and limb. Now, there is one country whose people are so exceptionally enterprising, wealthy and ingenious, that she, more than any other, could profit by the remedy suggested. That country, of course, is the United States.

The remedy found by the great industrial concerns is simply that of recognizing affirmatively the necessity of having the most

up-to-date contrivances, and of establishing an experimental department, whose business is, not only constantly to improve on old appliances and invent new ones, but to examine all schemes submitted by outside inventors, and test such as seem worth testing. This part of their work is like that of the "readers" in publishing houses, who read all MS submitted to the house, and report what is worth publishing. It is clear that, while the experimentalists and the readers must not recommend everything, neither must they condemn everything; they must steer the middle course of wisdom, lest the concern lose some invention or book, which it could make and put on the market to advantage. As to the experimentalists, they do another work fully as important, that of getting a promising invention into the best shape for manufacture and sale. Not one invention in a hundred, even if valuable, is so constructed as to be practicable for manufacture and sale, when first presented, any more than a MS is fit to be issued as a book. The invention, as illustrated in the model or drawings, is too expensive, or too weak in one place, or too clumsy in another, or too liable to rust in another; or the parts are so proportioned as not to make the article easy to make by machinery. So the experimentalists take hold of it; and sometimes they spend months of time and thousands of dollars, on drawings, and models and samples. At length, after every suggestion has been made and tried, and every objection met, then, and not until then, is a sample sent to the "shop," to be manufactured wholesale, and issued to the market.

But how could such a scheme be adapted to the navy? It could be by recognizing affirmatively the value of keeping up with the times, and by recognizing, further, that this, like many other necessary things, is hard to do, and that something must be sacrificed, to do it. The experimental departments of the industrial concerns cost a great deal of money, and complicate the organization, and take away the services of the best workmen; but nevertheless, they are kept up, and they are rising in importance from year to year. So, with the navy; if we start what would correspond to an experimental department, we must prepare to spend a great deal of time, money and brain work on it, and expect to find it a bother in many ways. Secretary Whitney, a man whose practical ability was demonstrated by his success in everything, laid

the foundation of such a work by appointing a Board of Officers, to investigate all inventions and new ideas submitted to the Department, and to report such as seemed worthy of test. The members of the Board were Captain A. P. Cooke, Commander C. F. Goodrich, Lieutenant-Commander R. B. Bradford, Lieutenant A. R. Couden, and Lieutenant S. P. Comly.

At the present time, when our battleships are so much more complex than the ships we had in Mr. Whitney's time, any adequate scheme of experimentation would have to be taken up on a much larger scale. And not only would it be necessary to see that every promising scheme should be given a trial, it would be equally necessary to see that it should not be condemned merely for a little defect that could be remedied. Not only this, it would be essential that every apparatus which proved good on test should *not* be fully approved then, but should be modified in detail in every way that the tests suggested, until the device were gotten into perfect form.

Then a perfect device could be sent to the "shop," be manufactured wholesale, and issued to the service. Not only would the device be sure to function well, when it appeared on board ship, but all devices for any given work would be alike; and the service would not only get a lot of good things it otherwise would lose, but the interval of time between the conception of a good idea and its appearance in our ships, in perfected form, would be reduced to a minimum.

It may seem that this plan would cause some confusion in our ships, by reason of many and frequent changes; but it may be pointed out that many causes of the frequent changes now constantly appearing in our ships would be obviated; because each device would go through its period of changing *in the experimental department*, and would not appear in a ship until it has assumed its final form. Here we again find ourselves in the same category as the manufacturer; because he finds it much cheaper and quicker to do all the experimenting *before* his wares are issued. It is necessary for him to find out the best final form, *before* his wares go out, and not to depart from them thereafter. He does not want to issue things from time to time, corresponding to our various Mark I, Mark II, etc., which are caused by improvements suggested by use *after* issue to the service.

In order to have an experimental department that should accomplish what is here suggested, a very considerable "plant" would be needed. What this plant should be cannot be determined, until it be first determined how seriously its work is to be viewed, but it seems sure that it should include a sea-going ship with a turret. In fact, when one considers that peace is the time, *and the only time*, in which to prepare for war, that ordnance is a constantly progressing art, and that there are a great many questions as yet unsettled, especially in ordnance, such as sights, mounts, powder, elevating gear, schemes of hoisting and loading, safety devices, etc., besides all sorts of drills, and that new questions are constantly coming up, the detail of a first-class battleship, from time to time, might be found advisable. Of course, this detail would diminish the fighting strength of our fleet, by just one unit; but it would diminish it only in time of peace, when fighting strength is not required.

The only loss would seem to be in fleet drill for the ship itself: for she could have as many other drills as the other ships, especially gunnery drills. Naturally, she would be kept in such shape that, on the probability of war, she could cast off her experimental character and join the battle fleet. The detail of a ship for experimental duty only, is here suggested, because experimental work of the completeness herein contemplated could not possibly be carried on by any ship cruising in fleet.

The writer does not wish to be misunderstood as advocating a pell-mell adoption into the service of useless gimcracks; or, as proposing a plan whereby our fighting fleet would be turned into an experimental laboratory, devoted to trying the wild schemes of every would-be inventor. Neither does he fear that the service will rush to any extremes in that direction; its whole tendency is the other way. To his mind, in the matter of mechanism, the service has never followed the middle course of wisdom, but has always kept on the side of ultraconservatism.

The injury resulting, it may be admitted, has been negative. But a negative injury, is just as important as a positive injury, and is much harder to prevent. An official may be prevented from stealing money and from doing deeds of violence, but who can prevent him from letting his department get behind the times?

A GENERAL STAFF.

The fact that the naval profession is a distinct profession, while the navy is a distinct organization under the government, combined with the fact that the military profession is the only other profession that lives under like conditions, combined with the further fact that our army has been given a general staff, has led some naval officers to believe that the navy should be given a general staff, which should embody the knowledge, wisdom and force of the navy, considered as both a profession and an organization. As this matter is important, it may be interesting to consider a few facts that present themselves.

If we examine the history of our navy and its condition to-day, we find two very important facts. One fact is that the actual duty done afloat has always been well done, both in peace and war. Mistakes have been made sometimes, duty has been neglected sometimes, officers and men have got drunk sometimes. But the mistakes and the neglect and the drunkenness have been so infrequent, and the skill, care, and sobriety have been so great, that our ships and fleets have always been well handled, and have always held the confidence of the American people.

The other fact is that the general direction of the navy has not always held the confidence of the American people. One often hears the highest praise from business and professional men of the wise direction of the Pennsylvania Railroad, the Standard Oil Company, Trinity Parish, Harvard University, the Bell Telephone Company, the New York Stock Exchange, the Astor Estate, the New York *Herald*, The Young Men's Christian Association, the Roman Catholic Church, and other organizations; but seldom of the direction of the Navy Department. Personally, the writer does not remember ever having heard it praised, though he may have done so. He has often, on the other hand, heard it compared unfavorably with other organizations by naval officers of all ranks, and he had often heard business and professional men speak of its methods as behind the times.

Now, need this surprise us? For the comparatively simple matter of handling ships and fleets, already constructed, we begin the education of officers at an early age, and continue it all their lives. But for the distinctive and peculiar work of shaping the policy of the navy, no one is educated, either in the navy or in civil

life. It is true that since the War College and the Naval Institute have been in existence, a few officers have educated themselves to a considerable degree; and the General Board, drawn from officers of this kind, has been able to do a great deal towards influencing the policy of the Department to proceed along correct military lines. The Board has been in existence so short a time, however, and its influence is so small, by reason of its purely advisory character, that less has been accomplished than is needed.

The need for such a Board becomes clear, when one recalls the fact that the naval profession now covers a very wide field, in both its military and its engineering phases; and that this field is increasing so rapidly, that it is impossible too for any one officer to master it. And yet the Secretary is expected, not only to master it, but to make decisions on the most difficult questions immediately after he takes his seat. A civilian with the natural genius of Napoleon could not do this wisely, unless he had counsel which was complete and correct, and so authoritative as to be a warrant for acting on it. Such counsel it is not in the wisdom of any one man to give; first, because no man has sufficient knowledge; and second, because the human mind, like the human eye, sees everything from one point of view only; incompletely and therefore incorrectly.

In order, then, to give the secretary correct counsel on any difficult subject, a multitude of counsellors (General Board) is needed, who study the subject, until, not only does each member get a clear view of the subject as it appears to him; but, by careful superpositions of views, they get a composite picture, which all agree on as correct.

The General Board has had to make its way against great opposition; but it has now proved its value so conclusively, that open opposition has almost ceased.

Now that it has proved its value, however, the insecurity of its position, and the lack of proper dignity surrounding it, are coming to be apparent.

Certainly, it seems odd that no steps should be taken to insure that the Board shall be continued, or that its recommendations shall be given heed. Some officers even argue that the Board should have executive authority in the military direction of the navy; in short, that it should be expanded into a general staff.

If any one will note the career of successful men and organiza-

tions, he will see that they usually begin either as assistants, or advisers, and gradually acquire influence with their superiors, until at last they are given authority, under those superiors. That this will be the case with the General Board, there is much in precedent to indicate.

The objection to a general staff has been raised that it would lessen the power of the secretary and tend to militarism.

This objection is ingenious, in that it arouses the suspicions of the people in general, and Congress in particular, who rightly insist on the subordination of the military to the civil authority.

Perhaps the objection is sincere in the minds of some; but if so, it must be because they suppose that it is necessary to make a general staff superior to the authority from which, alone, it derives its own authority. It seems hardly worth while to argue about that; but it may clear up the matter to ask if Von Moltke, the greatest chief-of-staff the world has ever seen, was superior to his superior, the king. If he was superior to his superior, the king, then it might be thought necessary to have a naval chief-of-staff, superior to his superior, the Secretary of the Navy. But Von Moltke was just as subordinate to his king as any person in the army—equally under his orders in every way. The king naturally followed his advice in certain prescribed matters:—but he followed the advice of his physician in certain prescribed matters; and yet the physician was not superior to the king. Also, he allowed Von Moltke to give orders directly to certain subordinates, but he allowed every officer in the army to give orders directly to certain subordinates. The German general staff was, and is, merely a part of the army, and if Congress should give the navy a general staff, that staff would be merely a part of the navy. It would be amendable to law; it would be under the orders of the Secretary; it would not be a wild and ruthless military despotism, trampling the rights of the people under foot, and stamping out the embers of Liberty with an iron heel.

On the contrary, it would be a body of mild and studious gentlemen, who would pore over maps and charts and plans continually, and try to arrange matters in such a way that the country would get the best return for the dollars invested in the navy. Perhaps it might be found best to give it a little executive authority, not independent of the Secretary, but under him, like the executive authority of the chiefs of bureau.

CONSERVATISM AND ULTRA-CONSERVATISM.

It is often said that all navies are conservative, and it is often said reproachfully. Yet we all know that there is no motto better than "hold fast that which is good," or one that expresses better the spirit of conservatism.

As the world has gone along, many men of many minds have sought Truth along many different paths. Nature seems to have helped but little in the search; so the seekers have sought with suffering, and the paths have been drenched with blood. Everything accomplished, every bit of knowledge gained, has been accomplished, or gained, by painful experience. Our human instincts have guided us little beyond preserving and perpetuating the race; yet there is that within us which makes us strive for something better and higher than the mere preserving and perpetuating of a brute existence. We have striven for it for centuries, blindly, but persistently. Much has been learned; many secrets of Nature have been wrested from her; many arts and sciences have been created; many rules of conduct have been established. To imagine that what has been accomplished by so much pain should not be treasured, is to imagine the human race a very foolish race; to suppose that any beliefs drawn from the past should be easily supplanted by mere plausible theories of the present, is to suppose something contrary to history and common sense. A very brief reflection is surely enough to convince us that, of all the virtues by the exercise of which the race has attained and maintained the excellence it holds to-day, the crowning virtue is conservatism.

The main trouble found in exercising the virtue of conservatism seems to be the same as that found in exercising some other virtues; the trouble of exercising it enough, and not too much. As we go on in life, gathering experience all the while, we naturally treasure our experience, and regard it as an asset. Clearly, it ought to be treasured, and is an asset. But the trouble is that our daily lives are apt to become so filled with our immediate duties, that we fail to take due note of changes, even of changes which affect the things in which we have had experience. Sometimes the changes make our experience useless, and sometimes worse than useless; because they make us base our ideas on something which was true, which is not true now, but which we think is true now.

This is one of the causes which make elderly men of so much less value, compared with young men, than they used to be; which, in commercial life, make it almost impossible for an elderly man to get a new position. It is ordinarily explained by saying that a young man is quicker to learn, and this is doubtless true; but one reason why he is quicker to learn is that he has less to unlearn.

The personal experience of individuals is often like the experience of organizations, large and small, even of nations. Certainly it is so in the matter of conservatism. In the attaining of what is called "practical success," we can see everywhere that those individuals, those organizations, and those nations, are the most successful, which practice the virtue of conservatism, without falling into ultra-conservatism; which keep up with the times, but do not run too far ahead.

The Chinese are so good an example of ultra-conservatism that no other is required. They held fast many things that were good; but they held them so very fast, that they failed to get hold of a great many other things that were good, that came within their reach. We see a like dullness in families, in business houses, in railroads, in manufacturing concerns, and everywhere. Everywhere we see the indolent, the careless, and the blind, who fail to join the triumphal procession of Progress, as it marches by. Those who do not fall in and catch step, impede the march, and vex the marchers:—so everywhere we seem to hear the adjuration, "Keep up with the procession, or get out of the way."

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A GENERAL SALES COMMISSARY SYSTEM FOR THE NAVY: THE JUSTICE OF ITS ESTABLISHMENT, AND A PLAN FOR ACCOMPLISHING IT WITH EXISTING MEANS.

By Paymaster George P. Dyer.

One of the most important questions in naval administration to-day—as directly affecting its military efficiency as any of ships or armament—concerns the increased care now required in looking after the welfare and contentment of the personnel. The change in the character of ships has brought with it a change in the character of their crews. The rough and ready tar has been largely replaced by the educated mechanic, whose requirements in the way of comfort are far greater. This is not an American problem only. It is one of the age and is a subject just now engaging the most serious attention of foreign admiralties. Service papers abroad are full of complaints and discussion of methods affecting the personnel, which sufficed for the past, but do so no longer.

A principal topic of concern in this phase of naval administration relates to the food furnished. Not less important is that of providing means to supply the men with the numerous articles of personal convenience,—even those in the nature of delicacies,—to which the present day sailor is accustomed on shore. Fortunately, we are well to the fore in the matter of food. But we are lagging in the second respect.

I propose to show that our whole service, afloat and ashore needs, and should have in equity to it, the establishment of a general sales commissary system for the navy. No room for argument exists as to the benefit it would be to service and to individual to have a well-regulated system of canteen stores or

shops extending throughout the navy. If it should be done, it will mean a substantial, as well as equitable, increase in personal incomes, through increase of their purchasing power.

I further propose to show how it may be done; and at the same time effect much needed improvements in the present restricted supply of articles, through canteens and stocks of "small stores."

An important merit of the suggestion is that it can be put into effect immediately, or at any date the Navy Department chooses, without the necessity of seeking further authority from Executive or Congress.

The plan here put forward, so far as known, has not before been hit upon. It is not an undigested one, however. Since the idea was suggested, and the investigation it involved was completed, four years ago, it has been on the anvil, being tested at every point as time and experience gave opportunity, until the belief has come that it is proof against objection. While looking for new means to meet a new condition, we seem to have overlooked old means at hand; which can be fitted to our purposes with advantage to themselves and with singular ease.

The plan in brief:

(a) The amendment of the Regulations by the Department to provide that "small stores" shall be available on ships and at stations for delivery to persons in the service wishing to buy them at cost, for cash, or under proper restrictions, on credit.

(b) The increase of the items carried as small stores by the Department to include all practicable articles, necessary for the personal convenience of the service at large.

(c) Departmental provision for the sale of such stores at cost, or at a uniform price approximating cost throughout the service, through the establishment of "Small Stores Issue Rooms" to replace the present anomalous "Ships Stores."

These provisions would operate to revive the almost forgotten utility and function of "small stores"; expand them to include substantially the area now covered by the canteen; and do away with it through the establishment of "small-stores issue rooms,"—as I should prefer to call them, to maintain a time honored title and avoid borrowing the word "commissary,"—for the sale of articles at cost price to the government, for the equal benefit of all persons in the service.

Thus, machinery, now existing and developed through years of experience will serve our purpose. In the purchase of stores

in bulk in the cheapest market, their custody, shipment and accounting, it can be used to introduce with the minimum stock a complete system of commissary sales stores like those of the army; at the same time performing the double purpose of correcting the evils of the present canteen system and breaking down the obsolete rules which make the present small stores' list almost useless.

The plan thus outlined, it becomes necessary to show why it should be adopted, and its practicability. To anyone acquainted with the benefits and convenience conferred upon a ship's company by a well-conducted canteen, there need be no proof that it is worth while to increase its scope to cover the entire service, and to make it more efficient by combining all canteens into one system, if it can be done. The success of the canteen aboard ship, proves that it has come to stay. Though heretofore given recognition only grudgingly, with onerous restrictions imposed retarding its growth, the ship is now rare that has no canteen, and the ship's store that does not flourish, unknown. In fact, the canteen has quite outgrown its tentative character and some steps must be taken to fit it in as one of the regular parts of the naval organization. When this is done, the system devised for it must be elastic enough to enable its benefits to be shared equally by all persons in the service, wherever stationed. Any other basis of organization would be lacking in equity.

HOW THE ARMY DOES IT.

The army long ago recognized this principle in the establishment of its sales commissary system. The act of July 28, 1866, on which Section 1144 of the Revised Statutes is based, provided in part:

> "The officers of the Subsistence Department shall procure and keep for sale to officers and enlisted men, at cost prices, for cash or on credit, such articles as may, from time to time, be designated by the Inspector General of the Army . . . . ."

The reason for the passage of this act may be simply stated. It was thought since the government had established unvarying rates of pay for persons in the military service, taking no account of stations to which, at its convenience, they might be assigned, it was incumbent on it to equalize the purchasing power of the pay given as far as possible, so that the soldier on the frontier

would be at no more expense in filling his commonest needs than the soldier detailed in the harbor of New York. It was thought the private,—and in still greater degree the officer with no ration or outfit given him, but having to subsist and clothe himself,—at a distant post, should not, in effect, have his pay reduced by reason of his assignment. The equity of this law to equalize the cost of living at different stations was emphasized when later Alaska, and finally Island possessions, made it necessary to send forces to points where accustomed articles in home brands were not to be found at any price.

The subsequent history of this law leaves no doubt of the acceptance of this responsibility by the government. Stores were sold under it till 1879, when on June 23, Congress provided that to the cost of all articles sold to officers and men, except tobacco, ten per cent should be added to cover wastage, transportation and incidental charges. It was found, however, at once that with this percentage added, at favored posts near good markets, the soldier could buy outside more cheaply than his comrade at the commissary on the plains. The appropriation act of the following year, therefore, removed the additional percentage charged "Companies, Detachments and Hospitals," that is, practically altogether as far as enlisted men were concerned, and by act of July 5, 1884, rescinded it for officers as well.

This reasoning still holds at the present time, as shown at a hearing last winter before the Senate Military Committee on the army appropriation bill.

"Secretary Taft.—'Now the Government, of course, furnishes the provisions to army officers from the commissary at a much more reasonable price than the provisions can be purchased in the open market, especially at those posts that are far removed from the markets.'

"The Chairman Senate Committee.—'The price is based on the initial price where they are purchased?'

"Secretary Taft.—'Yes, sir, it costs no more to an officer remote from the railroad than for one on the railroad.'"

Army sales stores are bought by purchasing commissaries (like our purchasing pay officers) situated in the principal cities of the country, the purchases being set against the annual appropriation, "Subsistence of the Army." These are distributed to the various posts, transportation charges being paid under a separate appropriation for that purpose, as with present ordinary naval

stores. Proceeds of sales are utilized to make fresh purchases until finally the total balance of the appropriation is covered into the treasury. Losses, damage or deterioration in the case of regular articles are accounted for on approved survey, strict regulations being enforced looking toward the prevention of such deficiencies and to responsibility for care and custody of stores.

The list of items on sale in these commissary stores comprises about 120 in number, in stores established for troops in the Philippines. This number does not include components of the ration which are also kept for sale. At home stations, the number is not quite so large. As compared with this, there are about 20 items only, exclusive of parts of uniform, which appear on the present list of small stores carried for issue on our vessels. Any person in the army who desires an article not on the list of the sales commissary, can usually avail himself of the facilities for purchase and transportation furnished by the government to secure it through the store by signing a promise to the effect that, when bought without competition, he will take and pay for it upon arrival, regardless of its condition. This was an easy and money-saving practice to establish after the store was started and the routine of purchase at wholesale rates under way. It would be equally easy and safe to do with any like agency created for the navy.

In order to discover just what the difference would amount to in trading at such a store as proposed and at ordinary retail shops, the writer undertook, some time ago, a comparison between the sales prices at the army commissary at the Washington, D. C., barracks and the prices at ordinary retail stores in that city. It was found that if a unit of each item should be purchased as priced, the total purchase at retail would be $34.02 as against $26.35 at the commissary, a difference of $7.67, or an average difference in per cent of more than 22 per cent on the retail price or more than 29 per cent on the commissary price. Curiously enough, these figures tally almost exactly with those arrived at independently, by a writer in the Naval Institute, in a more recent comparison between the prices of a typical ship's store and those at retail, in which an advantage in favor of the ship's store of more than 21 per cent was figured as against 22 per cent in this case.

These surprising differences are accounted for by the fact that in addition to his net profit, the retail dealer has to pay transportation from the point of original purchase, fixed charges for rent, clerk hire, delivery, etc., none of which have to be taken into consideration in determining the government price. The advantage of trading at a government store could not be more strikingly illustrated than by the above figures.

THE CANTEEN'S INHERENT DEFECTS.

The fact that the current form of canteen is defective, even in its present sphere, has been referred to. As it has grown, defects impossible to foresee have developed until now they are patent to every observer. The recent article referred to, indicated these objections and stated that at the base of all was the fact that each canteen is a separate, private institution and therefore, not wholly subject to regulation, or able to secure the benefits of co-operation. A scheme cannot stand the test of scrutiny which requires one set of men to contribute to create the store in order that another set may later enjoy greater benefits from it than possible to its founders; which makes optional the establishment of the store and thus renders it possible for some ships to enjoy its advantages and some not; which requires a changing policy with respect to profit-making in forcing unnecessarily high selling prices at first to gain a capital before they can be lowered to cost; and under which, therefore, there can be no uniformity in prices or quality amongst the different stores. The following recommendation from his last report, indicates what the chief of Bureau of Supplies and Accounts thinks of it:

> "Drastic restrictive rules are needed for the government of the ship's store, in order that the incurring of debts may be immediately and entirely stopped."

A moment's reference to the beginning of the canteen in our service will show how such an institution was permitted to grow up to supply a need which the proper agency could not do. With the inception of the modern navy, the enlisted personnel began to be of a higher class than formerly and their needs to be more complex. It was found that the old allowances for their comfort would no longer do. The ration was early improved, and again and again amended, in partial recognition of this state of affairs. Various attempts were made to increase the list of small stores

but, as we shall see, the complex and ironclad system of issue of these articles made them of no avail. The bumboat man came in at this point, at home ports, to supply the demand for toilet articles and minor delicacies in food, in addition to exercising his ancient vocation as tradesman in pies and fruits. When the Spanish war came, with its consequent increase in service in outports like those of the Philippines, the need for some regular source of such supplies became more acutely noticeable. An attempt was made, officially, to start a system of sales stores, when in 1899 a stock of such stores bought under "Provisions Navy" was sent to Cavite for sale to officers and men. This effort to meet conditions, however, failed as it turned out that the wrong means was employed. The Comptroller of the Treasury (6 Comp. Dec., 321) held there was no authority to establish such stock, and that:

"The appropriation for subsistence of the navy (provisions navy) is not available for the purchase of any article of subsistence except such as the law authorizes to be purchased and issued to the enlisted men of the navy, and cannot be used for the purchase of articles of subsistence which may be authorized to be purchased and sold in the commissary stores of the army."

Thus, one effort to conduct such a store under navy auspices was nullified and we were forced to the rather humbling expedient, to relieve a situation of serious discomfort, of getting permission from the War Department for the naval forces to deal at the army sales commissaries in the Philippines.

The British navy is still struggling in the bumboat stage of the development of its canteen, except that it has gone so far as to transfer the bumboatmen from the dock or a boat alongside, to quarters aboard ship. They thus have made the way more difficult for proper reform. British ship's stores are usually conducted on the "tenant" system, in which the citizen proprietor, not connected with the service, pays rent for the privilege of running a store on board, under the supervision of a committee of the crew. The whole tendency of the plan is to give the customers of the canteen poor service to the resulting profit of the proprietor,—and it is no wonder there is loud criticism of it.

With better fortune we took the course of permitting cooperative canteens on board, with the commissary officer in charge, wherever the pressure for them was sufficient to overcome the

onerous condition requiring private subscription and prohibiting purchase of stock on credit. We at least, were spared the difficulty now lying before the British of having to correct an entirely false start along the line of private ownership before taking the right course.

In our service, it was soon noticed on ships where canteens were started that there were in effect two distinct stocks of articles of convenience on board. The canteen stock and that of small stores, paralleled each other. Though managed by the same officer, they were kept distinct because of the private nature of the one, and the difficulties in issue of the other. The canteen, being much the more accessible, immediately usurped the function of the small store stock at all points where the two touched, besides furnishing many other items not in the very restricted list of small stores.

A research developed the reason for the present atrophy of the small stores' list. In the early days of the navy, supplies of this kind were considered separately from clothing, with which in later times, through an accidental and temporary likeness, they got confused. The consolidation of the Clothing and of the Small Stores' funds served to increase the confusion of ideas concerning the real functions of these two classes of articles. Once on the right track, a moment's clear thinking will show their essential difference. Clothing is provided where enlisted men are, for a military reason, to keep them in uniform. From the peacoat to undershirt, every article is prescribed and must not be varied, in form or texture. It is necessary to issue clothing to a man sometimes when he does not want it, and, on proper authority, to charge its value to him with or without his sanction. For this reason, close oversight of each item is imperative and any system of cash payment is impossible with clothing. The commanding officer's strict oversight is required, not only as a means of assuming control of the issue of uniform but to protect the man under a system of charging-up cost of purchases.

Why the Small Stores System Failed.

On the other hand, small stores are kept solely for the *convenience* of the men, not to serve any military purpose of the government. They are not of prescribed type. There is no such thing as "regulation" shape of plug tobacco or bar of soap.

Specifications for them are to secure the delivery of good quality only. For this class of stores the man "puts down" willingly. He is never required to take them nor does the commanding officer of the present day care whether he uses them at all, or prefers to provide himself from other sources.

In the early days, the ship's purser was allowed a percentage on small stores charged up against the crew. Experience proved, as long as he had a monetary interest in the quantity sold, that some effective check should be put upon him for the protection of the men. The scrutiny of the commanding officer of each article issued, as well as of amount charged, was already required for clothing. Some one conceived the idea that this check might be applied to small stores as well. This makes it obvious how the confusion referred to occurred. It came about as desirable for the captain to direct the issue and charging of clothing by article to keep the crew in uniform; and of small stores to keep check of the issues. Provision to this effect was therefore embodied, not to say embalmed, in the regulations of 1841 and was copied from volume to volume because no particular reason appeared for striking it out. But in 1842, that is the very next year, the necessity for it in the case of small stores was done away with when all private supplies aboard ship were taken over by the government and pursers' percentages abolished. The incubus of trouble and delay involved in such a routine, and in its necessary accompaniments of charging up issues has gradually made small stores, carried solely for the convenience of the men, most inconveniently inaccessible to them.

Such a system might well serve, without bringing particular notice to its defects, until a better one presented itself. Up to the time of the entry of the canteen aboard our ships, we did not conceive, generally, of any better plan than that given in the issue, once a month, of clothing with all purchases put "on the books." The ship's store has, however, illustrated the enormous advance in convenience and simplicity, gained in doing a daily business on a cash basis. The canteen's method of handling this class of stores holds up to ridiculous comparison, one by which a man is required to foresee a month ahead that he is going to lose a whisk broom, or to run short of tobacco. Lack of foresight, or hard luck, with regard to small stores will not usually make his division officer undertake to overcome the quiet opposition he

meets, from the captain to the jack-o-dust, to the special issue of an article not palpably essential for a man's welfare. Under the regulations, the division officer is only required to:

"make out a special requisition for clothing that is absolutely necessary to preserve the health of any member of the division."

So when the canteen came, the small stores' stock was duplicated for all practical purposes and left to its fate,—to be throttled by red tape.

It was the consideration of all these questions, the desirability of a general canteen system for the navy, the defects of the present ship's store organization, and the sad state of the small stores' list, that finally brought the dawn of the idea that they might be all so related as to be susceptible, possibly, of the same solution. It then became obvious that the logical step would be the development of small stores, to take the place of the present canteen. This would certainly seem a more logical procedure than to start up any parallel system which would be wholly new. If this could be done, the mechanism of the clothing and small stores' fund could be put into operation towards the maintenance of the proposed "Small Stores Issue Rooms," and that fund could be made the reservoir, as it should be, for all stores of this character. All the machinery for receiving, inspection, storing and shipping to any part of the world is now in operation at the principal depots for clothing and small stores. Paymasters of ships could make requisitions as now, to be ordered shipped from the nearest depot, cost of transportation, as now, being paid from the special appropriation provided for that purpose. Such articles as might be on the revised list of small stores and which it might not be desirable or necessary to buy in large quantities, could be obtained as needed from these depots, on open purchase requisition in the usual manner. On foreign stations, or with stores of perishable nature, purchase could be covered by a ship's requisition with the approval of the commanding officer, just as articles of small stores, particularly soap, are now purchased abroad when necessary. In fact, the modification in the present routine of responsibility and accounting for these supplies to meet the changed conditions, would be slight indeed as compared with the creation entire of a new system. The changes involved would seem to be principally in bringing up the method of issue and

increasing the variety of small stores to a point to compete on favorable terms with the present canteen.

With the situation so far defined, it became necessary to undertake a search to determine definitely, if possible:

(1) If any reason exists which will prohibit the change from the present method of issue of small stores to substantially a cash method.

(2) If any reason exists which would prevent the expansion of the small stores' list to include all classes of articles now on sale in canteens.

(3) If any exists which would prevent sale at cost as in army commissaries.

Aside from the interest developed in this investigation, its results were happy in proving the plan to be not only practicable, but the only logical one in the light of the history of such stores in our navy. Its outcome more than justified the weeks of research it involved. It demonstrated that the department has within itself all the necessary authority to make the required changes, and consequently, that the usual stumbling-block to reforms in the service,—an appeal to Congress,—is not to be met with. It proved that far from there being impediment to the expansion of the small stores' list, to include all articles needed for the convenience of the service, that such was its original condition and function. An unexpected result was the discovery that food-stuffs now excluded from small stores, were originally a principal part of small stores' issues, as they are now of the business of the canteen. It developed also the justice of the conviction that equity can only be accomplished in the sale of these stores, at cost, by disclosing the convincing reasoning governing their disposal in that way, in the other branch of the service. However, aside from his general interest in the past of our navy, it is but fair that the reader should judge for himself whether these positions are maintained in a résumé of the field covered in the search.

THE HISTORY OF OUR SMALL STORES.

The earliest regulations of the navy were those passed by Congress on March 2, 1799, and among many things quaintly stated, they provide:

"The captains are frequently to cause to be inspected the conditions of the provisions, and, if the bread proves damp, to have it aired upon the quarter-deck or other convenient places, and in case of the pickle being

leaked out of the flesh casks, he is to have new pickle made and put therein after such casks are repaired."

"The men shall, at their request, be furnished with slops (clothing) that are necessary, by order of the captain, and the amount delivered to each man shall be regularly returned by the purser so that the same may be stopped out of his pay."

The regulations of April 23, 1800, though of great interest as the basis of the present "Articles for the Government of the Navy," are concerned chiefly with disciplinary matters. Those of September 17, 1817, prepared under authority of Congress of February 15, 1815, make the first mention of what would now be called small stores. Besides providing for the issue by the ship's purser of clothing at 10 per cent advance (as "compensation for the risk and responsibility"), they permit him to sell tobacco at 50 per cent advance over "cost and charges" as furnished by the government, and also certain other articles on his own account, among them mustard and pepper, at an advance of 25 per cent. His profits on clothing, tobacco and other articles were to be strictly accounted for to the treasury, and "wages" and profits on tobacco were not to be allowed him in his account until his returns were settled. When the pay of pursers was increased in 1841 these profits were set off against his pay, but till that time they were perquisites and he was merely required to submit his account of receipts and expenditures in order that his profit-taking might be supervised. That this was so is corroborated by the fact that the act of April 18, 1814, which allowed pursers $40 a month and two rations, remained in force long after the pay of all other officers was much increased; while the purser's bond was fixed by act of March 1, 1817, at $25,000, instead of $10,000 as previously,—heavy amounts for those days.

The purchase of clothing and tobacco furnished pursers by the government was affected through "navy agents" from general appropriations providing for construction of ships, and pay and subsistence, from 1798 to 1843. It is not until the latter year that the first specific appropriation for clothing is made. Small stores are not named in appropriation or other acts till 1879.

The number of articles the pursers were permitted to carry on board to sell for their own profit by the regulations of 1817 as well as the percentage allowed them were soon much increased, for a volume of the early orders and customs of the Navy De-

partment, compiled in March, 1838, states under the head "Allowances to Pursers."

". . . . . They are also allowed 5 per cent upon clothing delivered to the crew (January 29, 1803).

"25 per cent upon articles of secondary necessity, embracing all articles not denominated luxuries, upon which 5 per cent is not charged (July 27, 1809).

"50 per cent upon luxuries such as tea, coffee, sugar, and tobacco, when furnished either to officers or crew.

"In vessels of 20 guns an additional allowance is made upon groceries, of 5 per cent, and in vessels under 20 guns of 10 per cent upon the same articles."

That is, pursers were allowed to charge 25 per cent upon all articles including groceries, not clothing or "luxuries," with an additional 5 or 10 per cent upon all groceries either luxuries or "of secondary necessity."

The practice of carrying groceries on board for sale to the crew was an early and a long established one, for though tea and sugar appear in the ration table incorporated in the regulations of 1817, their addition was declared unauthorized, it not being until 1842 that tea, sugar, coffee or cocoa were first made part of the ration by Congress. As confirming this, forms for pursers' provision return of ration stores as late as 1838, and the ration tables in the regulations of 1841, do not include any of these articles. That they were considered as "small stores" appears from the "Regulations for the Government of Pursers" of 1838 which provide for accounting for the purser's personal stores under that name, as distinguished from "slop clothing" and the ship's "provisions."

The regulations of 1841 were the first published after 1817. They show ample evidence of a thorough hand, which besides combining under one cover the traditions which had grown up outside the older volume, changed many ancient practices. For the first time purser's stores are formally defined.

"Art. 296.—All articles forming part of the ration, or taken on board as substitutes for parts of the ration, shall be considered as 'provisions.'

"Art. 297.—All articles of clothing or bedding . . . . shall be considered and called 'slop clothing.'

"Art. 298.—All articles of groceries not being parts of the ration, and all other articles not being 'provisions' or 'slop clothing' taken on board in conformity with the regulations to sell for the convenience of the crew, shall be considered as 'small stores.'"

Tradition as to the purser's percentages and rates of pay was not treated so respectfully. Article 309 provides:

"All articles of slop clothing and small stores, issued by pursers shall be charged at an advance of 15 per centum on their net cost, excluding freight and other charges. In the settlement of their accounts, they shall be allowed for the sale of these articles such sum as with their pay and ration, shall make their whole annual compensation as follows:

"If Congress shall hereafter regulate the pay of pursers in such manner as shall entitle them to receive their entire compensation from the United States instead of deriving a part of their emoluments from the proceeds of sales to the seamen, as proposed in the next preceding article, then the percentage to be charged on all articles of clothing and small stores shall be 5 per centum on the net cost and no more."

Following the older regulations in which the issue of small stores to each man was limited to a definite quantity of each article yearly, not to be exceeded except on written order of the commanding officer, those of 1841 provide, with a familiar ring, that the captain "will order in writing, such clothing, small stores, and such only, as may be required for the health and comfort of the men." The reason for this provision has been explained. Though on account of its continuing application to clothing, a similar provision has come down to the present day; the necessity for this check in the case of small stores was obviated the next year, for Congress in 1842, besides reorganizing the Navy Department, substituting the present bureau system for the Board of Navy Commissioners, also on August 28, provided for the removal of all private stores on board ship and fixed definitely the pay of pursers in the following terms:

"Sec. 1.—Be it enacted, etc., that all purchases of clothing, groceries, stores, and supplies of every description, for the use of the navy, as well as for vessels in commission as for yards and stations, shall be made with and out of the public monies appropriated for the support of the navy, under such directions and regulations as may be made by the executive for that purpose; and it shall not be lawful for pursers or other officers, or persons holding commission or employment in the naval service, to procure stores, or any other articles, or supplies for, and dispense thereof to the officers or to the crew during the period of their enlistment, on or for their own account or benefit; nor shall any profit or percentage upon stores or supplies be charged to or received from persons in the naval service other than those which are hereinafter described."

"Sec. 2.—Gives power to the executive to prescribe all necessary rules for the purchase, preservation, and disposition of supplies for persons in the navy.'"

"Sec. 9.—All stores of pursers on board ships in commission shall be taken by the government at a fair valuation under the direction of the Secretary of the Navy."

Apparently the percentage previously contemplated by the department in case of the passage of this act was not deemed sufficient, for in less than three months, on November 17, the chief of the new Bureau of Provisions and Clothing, Charles W. Goldsborough (for 19 years before secretary to the Board of Navy Commissioners), over his own signature, published a circular to the following effect:

"In order to protect the government from loss in the issue of clothing and small stores, it has been decided for the present that 10 per cent shall be added to the cost of all such articles and that they shall be issued to the seamen and others at such addition to their cost."

Thus the government assumed charge of all pursers' stores including groceries, and thus, the additional percentage to be charged by it on issue was first fixed.

In 1843, $380,000 was appropriated by Congress for clothing for the navy, including transfers, and every other expense to be reimbursed out of the sale of clothing for the first half of the calendar year 1843. This was the first separate appropriation for clothing; and while it is not stated to be its purpose, this act operated to create a fund, which was added to in the following years:

That the establishment of a fund under this act was not entirely without question appears from the fact that it had to be definitely settled by the insertion in the appropriation of 1847 of the following provision; the first act to name specifically the clothing fund:

"That from and after the passage of this act, all moneys derived from sale of all stores and other articles belonging to the navy shall revert to that appropriation from which such stores and other articles were originally purchased; . . . . that it shall not be lawful hereafter to make transfer from the clothing fund, or the head of the appropriation for clothing for the navy, to another head of appropriation, except in the adjustment of the accounts of disbursing officers."

No mention is made in the acts of appropriations of small stores, they evidently having been originally purchased and maintained through other appropriations. Neither a volume contain-

ing the regulations, circulars, etc., of the department, 1832 to 1851, or the instructions to pursers of '55, '62, '65, or '76 yield information as to how this was accomplished. It is certain, however, that in 1878 just before the creation of the small stores' fund they were carried under "Pay of the Navy," the fuller forms of that date showing all expenditures and receipts of small stores as accounted for under that appropriation.

The ten per cent advance for purposes of issue provided in 1842 obtained till 1869. The record of subsequent years is of twofold interest as showing the variation of opinion as to the necessity or the propriety of issues at advanced price, and the means taken to register the changes it occasioned. Under authority of a series of bureau circulars, approved by the department, after 1869 clothing and small stores were first issued at invoice price with no advance (September 18, 1869); then at ten per cent on cost again (September 22, 1874); then at average cost with percentage once more abolished (June 30, 1877), which method held for 13 years till (July 9, 1890), five per cent to cost was added, shortly after increased to ten per cent, at which figure it remained till September 9, 1902, (G. O. No. 107), when a uniform price was established by annual circular, the percentage of advance over cost to cover losses being adjusted in Washington.

Before 1855, and probably soon after 1842, the number of articles of provisions carried for so many years as small stores, was reduced as a new ration was established by act of August 29, 1842, which included among a number of new items, sugar, tea, coffee, and cocoa, formerly considered "luxuries" as will be remembered; and made it unnecessary to carry them separately from the ship's provisions. Mustard and pepper, however, on the list of pursers' stores of 1817 still appeared on the small stores' forms of 1855 and survived as articles regularly carried under that name to a time within present memory. Among other things, "grass" for hats coming in "hands" was also carried for a while, appearing on the forms of 1855 but disappearing before those of 1878. For a while as is also shown in the forms of 1855 to 1878 small stores were issued to mess cooks upon mess requisitions instead of on divisional requisitions, as in the case of clothing. This issue by messes as the social unit on board, as distinguished from the division, the military unit, seems a partial recognition of the distinction existing between small stores and

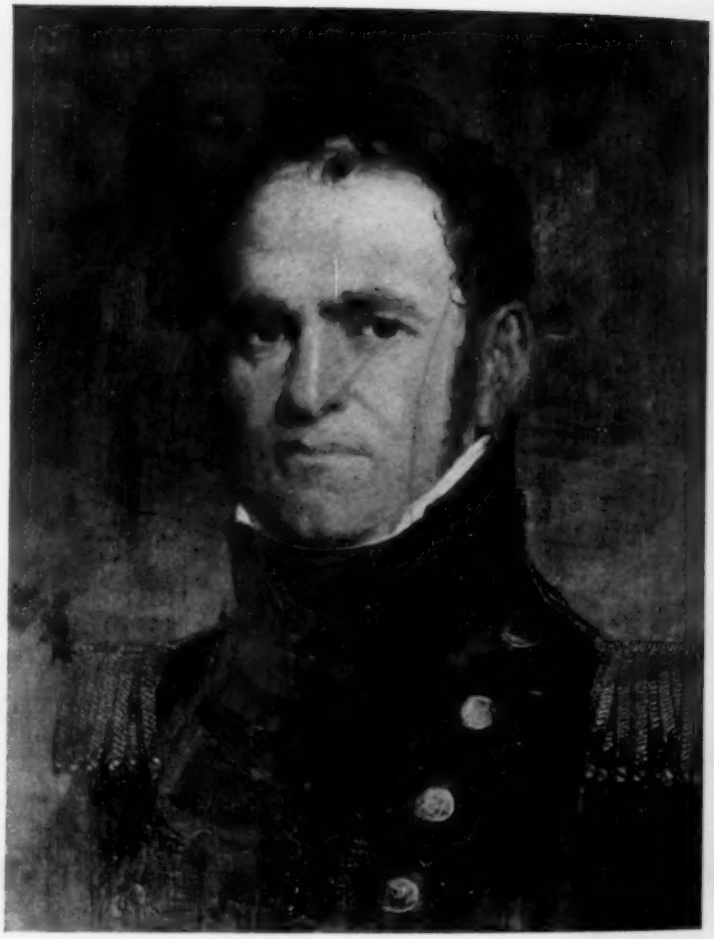
clothing. However that may be, this practice has disappeared. In February, 1879, small stores carried under "Pay of the Navy," as a matter of account, were constituted the stock of a fund in the following language:

"From and after the first day of April, 1879, the value of issues of small stores shall be credited to a fund to be designated as the "Small Stores Fund" in the same manner as the value of issues of clothing is now credited to the "Clothing Fund," the resources of the fund to be used hereafter in the purchase of small stores for issue."

In 1890 the two funds were consolidated and with the addition of a million dollars in each of the years 1898, 1899, and 1903 ($1,000,000 having been returned to the treasury in 1870, and $325,000 by the appropriation act of 1888), the clothing and small stores' fund on July 1, 1906, amounted to $4,478,242.62.

In conclusion, the reader is reminded that though he may possibly have seemed to wander afield, and the subject of small stores to have taken on an importance beyond its merit, in comparison with the large questions affecting the navy, it is, after all, the humble means by which great benefits and efficiency may be promoted. The contentment of our personnel is a large question,—one of the largest in our service,—and nothing so much affects that contentment as easy access to creature comforts.

Looked at in this perspective, he will agree that in importance our subject takes rank with the greatest.



COMMODORE JOHN RODGERS, U. S. N.
NAVY COMMISSIONER, 1815-1824, 1827-1837.
(From a portrait, by Jarvis, at the Naval Academy.)

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NAVAL ADMINISTRATION UNDER THE NAVY COMMISSIONERS, 1815-1842.

By CHARLES OSCAR PAULLIN.

THE PERSONNEL OF THE NAVY DEPARTMENT.

The American navy during the War of 1812 fought itself into public favor and convinced the nation at the cannon's mouth of its value and importance. During and immediately after this war the navy for the first time found itself popular with Congress and the people. The nascent spirit of nationalism now demanded a naval armament. The Republicans, admonished by both victories and defeats, faced right about, and seemed to admit, as did Robert Y. Hayne, several years later that the naval policy of Jefferson was a delusion.[1] They no longer argued, as they often did before 1812, that the addition of ships to a minor navy in effect added vessels to a superior one, for in case of a naval war, the vessels of the former must necessarily fall into the hands of the latter. The new arguments which were now upon their lips seemed as if drawn from the armory of the elder Adams. "The destinies of the nation," the Secretary of the Navy declared in February, 1815, "appear to be intimately connected with her maritime power and prosperity; and as the creation of a Navy is not a work to be quickly performed, it seems necessary not only to cherish our existing [naval] resources, but to augment them gradually and steadily." In December of that year he recommended that five ships be annually added to the national fleet. President Madison was in general accord with his Secretary of the Navy.[2] A new period in the history of the American navy had opened.

[1] Cong. Debates, IV, 350.

[2] Cong. Letters, Navy Dept. Arch., II, 367-369; State Papers, Nav. Aff., I, 365-366; Richardson, Messages and Papers of the Presidents, 566-567.

During the twenty-seven years extending from 1815 to 1842, nine men filled the office of Secretary of the Navy. Their average term was three years. Their names and periods of service were as follows: Benjamin W. Crowninshield, of Massachusetts, 1815-1818; Smith Thompson, of New York, 1819-1823; Samuel L. Southard, of New Jersey, 1823-1829; John Branch, of North Carolina, 1829-1831; Levi Woodbury, of New Hampshire, 1831-1834; Mahlon Dickerson, of New Jersey, 1834-1838; James K. Paulding, of New York, 1838-1841; George E. Badger, of North Carolina, 1841; and Abel P. Upshur, of Virginia, 1841-1843. Of these nine men, all except Crowninshield and Paulding were lawyers; and rather oddly, jurists, since they had served as judges in the courts of their respective States. Only four of the nine had served in Congress—Southard, Branch, Woodbury, and Dickerson. These lawyers and jurists, when first called upon to perform the unfamiliar duties of their office, sometimes made amusing blunders. Secretary Branch actually resolved to send a frigate into the Pacific Ocean to pass Cape Horn in the month of June in order that it might have the benefit of a summer passage; and once he gravely asked an officer of the navy on what part of the coast of South America the island of Barbadoes was situated.[3] At a dinner, given shortly after Southard received his appointment as Secretary of the Navy, Chief Justice Kirkpatrick of New Jersey, twitting this landsman on his ignorance of the sea, exclaimed, "Now, Mr. Southard, can you honestly assert that you know the bow from the stern of a frigate"?[4]

Not until after 1820 did political, personal, and geographical considerations become all-important in the selection of Secretaries of the Navy. The early presidents had a conviction that the head of the Navy Department should possess a knowledge of maritime or mercantile pursuits; and at least four of the first five secretaries had such a knowledge. It was supposed that men of this sort were better fitted to administer naval affairs than lawyers, judges, or statesmen. President Madison once offered the secretaryship to Commodore John Rodgers, one of the most skillful and efficient officers of the Old Navy, who at the time lacked but one number of being at the head of the navy list. When Crownin-

[3] J. Q. Adams, Memoirs, VIII, 354.
[4] Appleton's Cyclopedia, V, 613.

shield vacated the department in 1818, Rodgers was again offered the office, and he again declined it; naturally preferring his rank and permanent tenure in the navy. Before President Monroe finally chose Smith Thompson, John Quincy Adams, the Secretary of State, recommended Thomas Worthington, late governor of Ohio, as a suitable candidate from the Western States, and as "having once been a seafaring man."[8]

Benjamin W. Crowninshield, 1815-1818, was the last of the old line of secretaries. He and his brother Jacob, to whom Jefferson had offered the naval portfolio in 1805, were merchants of Salem, Massachusetts, when the sails of Salem's ships of trade whitened every sea. Early in life each of the two brothers had commanded East Indiamen. Crowninshield's successor, Smith Thompson, 1818-1823, first of the legal and juridical line of secretaries, found his position in the Navy Department a convenient stepping-stone from the Supreme Court of New York, which he left in 1818, to the Supreme Court of the United States, to which he was elevated in 1823. Levi Woodbury, 1831-1834, who had a most remarkable career as judge, senator, and cabinet officer, also reached the Supreme Bench, but in his case some years after he left the Navy Department.

That the two North Carolina lawyers and jurists, John Branch, 1829-1831, and George E. Badger, 1841, should have been invited to administer the navy, illustrates the fact that politics, and not a practical knowledge of the marine, had become the controlling factor in choosing naval secretaries. North Carolina was for many years unfriendly to the navy. Her lack of important seaports, and therefore of wide commercial and maritime interests, caused her to be behind her sister State, South Carolina, in naval sentiment. The services of Branch and Badger in the Navy Department are not especially important. Branch's naval policy was one of retrenchment and reform. The social dissensions of Jackson and his cabinet over Mrs. Eaton caused Branch to drag his anchor in the department, and he was expelled from the cabinet in 1831. Badger was in office only from March to September, 1841. Having been appointed by Harrison, he resigned on the separation of Tyler from the Whig party.

Neither Badger nor his successor, Abel P. Upshur, was, when

[8] J. Q. Adams, Memoirs, IV, 136, 144.

appointed, widely known outside of his own State, in which, however, they were highly regarded. When Badger was nominated by the President, more than one Congressman propounded the query, "Who is George E. Badger?" A similar question might have been appropriately asked on the nomination of Upshur. He was characterized in the public prints of the time as "an accomplished gentleman of the Virginia school; and in all the social relations of public and private life, he is dignified in manners, conciliatory in deportment, and accessible to friends, to neighbors, and to all others in the common intercourse of business."[8] The policy of the Badger-Upshur administration was one of naval increase and expansion. Before appointing Upshur, Tyler had offered the naval secretaryship to Captain R. F. Stockton, of the navy, who declined it.

The choosing of James K. Paulding, 1838-1841, was in a way an application of the principles of civil service. He had been connected with the department for twenty-three years, first as secretary to the Board of Navy Commissioners and later as navy agent at New York. This long experience was a valuable preparation for his more exacting duties as Secretary of the Navy. Until 1838 Paulding was, however, primarily a literary man, a writer chiefly of fiction and essays. Not until he became secretary, did the navy exact his best thought and exertions. Indeed, he owed his entrance into the department and his final promotion to its headship, to his eminence in literature quite as much as to his abilities as an administrator. His Jacksonian democracy of a pure type, his residence in New York, and his acquaintance and friendship with the leaders of his party, were also important factors in determining his political career. It is said that President Van Buren first offered the naval portfolio to Washington Irving, who upon declining it suggested Paulding, his literary friend and his collaborator in the writing of "Salmagundi." Had Van Buren been successful in the presidential election of 1840, Paulding would have doubtless remained in the cabinet. On November 11, 1840, just after the result of the election had been decided, he wrote to Irving that the "question being now settled, I am perfectly resigned to my fate, and cannot resist the inclination to rejoice at the prospect of getting rid of a laborious, vexatious, and

[8] Army and Navy Chronicle for 1841, 290.

thankless office, in which my duty has been almost always in direct opposition to my feelings, and I have been obliged to sacrifice private to public considerations."[1]

Of the nine naval secretaries of the period 1815-1842, Samuel L. Southard rendered the most efficient service. For one reason, his term of office was longer than that of either one of the other eight secretaries. It extended from September 16, 1823, to March 3, 1829. Beginning under Monroe, he served throughout the administration of John Quincy Adams. The younger Adams had imbibed the naval views of his father, who was for a long time one of the chief promoters of the American navy. He took the greatest interest in improving this arm of the military service. Southard and Adams were well-mated, and were vigorous and far-sighted naval administrators. Southard's ability as an executive consisted not so much in a knowledge of the details of the navy, as in his intelligent conception of the navy's needs and his steady exertions to satisfy them. He had the practice, which not every secretary has had, of looking beyond the limits of his desk and its daily load of routine business. In his reports, hardly a subject of naval betterment escaped him; he boxed the compass of naval reform and improvement. His recommendations were always practical, and were easily attainable could Congress have been moved to adopt them. Among other measures he recommended the establishment of a naval academy, the reorganization of the navy and the marine corps, a complete survey of the coasts of the United States, the sending out of an exploring expedition, higher ranks for the navy, a plan for the improvement of the navy yards, and the construction of dry docks. Some of these improvements Southard obtained, but others were postponed for many years. He vigorously maintained the discipline of the navy. This may have had something to do with making him rather unpopular with the service. Charles W. Goldsborough, the secretary of the navy board, is quoted as saying that the navy commissioners and all the navy "were extremely dissatisfied with Mr. Southard's administration of the Navy Department, and especially mortified at an intimation in a late report that few of the navy officers were profound astronomers."[2]

[1] Griffis, M. C. Perry, 157; Paulding's Paulding, 283.
[2] J. Q. Adams, Memoirs, VIII, 141.

Southard took his office rather more seriously than did his two predecessors. He was less generous to himself in fixing limits to his summer vacations. On March 25, 1819, John Quincy Adams wrote in his diary: "Mr. Thompson, the Secretary of the Navy, left the city this morning for a visit to New York. The office sits easy upon its holders. Mr. Crowninshield used to remain in Washington only when Congress was in session, and spent the remainder of his time at home. Mr. Thompson appears to be determined to follow his example. The chief clerk and the navy commissioners make the duties of that department comparatively light."[9] This visit of Thompson, which began on March 28, did not end until December 8. No subsequent secretary has been absent from the department for so long a time. That the navy did not suffer by reason of the long absences of Crowninshield and Thompson was because of the efficiency of the chief clerk, and more especially because the Secretary of the Navy had been relieved since 1815 of many details of administration by the Board of Navy Commissioners. The establishment of this board will be now considered.

Before the War of 1812 some of the naval officers had advocated the establishment of a naval board to assist the Secretary of the Navy in the performance of his duties. In 1798 Commodore John Barry recommended the vesting of the management of the navy in three naval commissioners. Benjamin Stoddert, the first Secretary of the Navy, in one of his last reports to Congress said that the business of the Navy Department embraced too many objects for the superintendence of one person; and he recommended the "establishment of a board to consist of three or five experienced navy officers, to superintend, in subordination to the Head of the Department, such parts of the duties as nautical men are best qualified to understand and to direct."[10] The first Republican Secretaries of the Navy were inclined to simplify the machinery of the department, rather than add to it. Since the navy was small and simple, they did not feel the need of technical advice in managing it.

The War of 1812 greatly increased the work of the Secretary of the Navy, and soon caused him to seek expert counsel and assist-

[9] J. Q. Adams, Memoirs, IV, 310-311.

[10] Griffin, Commodore John Barry, 336; State Papers, Nav. Aff., I, 75.

ance. It also directed the attention of Congress to those administrative abuses that had arisen under the existing system. In February, 1813, soon after he entered upon his duties Secretary of the Navy Jones complained that the minor details of the naval business diverted his attention from its larger and more important objects. He recommended the appointment by the President of a naval purveyor, and of several deputies to reside in the chief seaports. They were to purchase all the naval supplies, and were to be under the control of the Secretary. Jones's object was to systematize and expedite the purchase of supplies and to correct existing abuses."[11]

The beginning of the specific movement that resulted in the establishment of the Board of Navy Commissioners may be dated with a report of Jones, made in February, 1814, to the naval committee of the Senate, recommending the reorganization of the Navy Department. On March 18 the Senate ordered Jones to devise and digest a system for the better organization of the Navy Department.[12] Owing to the increased work caused by the war, Jones was unable to make a report until November 15. This contained a bill for the better organization of the department, which he discussed at some length. The bill provided for a board of inspectors of the navy, consisting of three naval officers and "two other judicious persons, skilled in naval affairs." The President of the United States was to designate the presiding officer of the board and to appoint its secretary. The latter was to keep a record of the proceedings of the board and transmit copies of them to the Secretary of the Navy " for the inspection and revision of the President of the United States." The board was not to sit at Washington, but at some convenient and central port. The Secretary of the Navy was to assign separate duties to each of its members. The five classes of duties were as follows: general correspondence and the preparation of reports, estimates, and statements; personnel of the navy and naval courts; ordnance and transportation; victualling, sustenance, and medicine; and equipment of vessels. The last two classes were to be in charge of the civilian members. The bill further provided, that for the faithful performance of their duties the " said inspectors shall, severally,

[11] State Papers, Nav. Aff., I, 285.
[12] Annals of Cong., XXVI, 672-673.

be held responsible, under the instruction, and subject to the revision of the board of inspectors, to which a statement of all the transactions of each inspector shall be submitted, for revision, at each stated meeting, and an abstract thereof transmitted monthly to the Secretary of the Navy." [13]

Jones's recommendation provided also for the appointment of a chief naval constructor, two assistant naval constructors, and a paymaster of the navy; and for the establishment of a naval academy. His plan for the reorganization of the department stripped the Secretary of the Navy of his principal duties and prerogatives. Exactly what powers would be left to him is not clear. Jones's experience in the department seems to have convinced him that a civilian was not able to manage a naval war without professional assistance.[14] With the President and the Secretary of the Navy at Washington, and with a board formed after Jones's plan at New York or Boston, the business of the navy must have become greatly confused. In short, his plan would not have worked. It was too complicated. Responsibility was too diffused. Jones evidently was a novice in political science. The chief officers of the navy quickly detected the deficiencies of his plan.

A committee of the House of Representatives on retrenchment and reform in the management of the naval establishment, which had been appointed in March, 1814, sent Jones's report to every captain in the navy with a request that he suggest such additions and alterations as appeared to him necessary. The captains invariably approved the recommendation for the appointment of a navy board. Captains Bainbridge, Stewart, Hull, Decatur, Evans, Morris, Shaw, and Tingey offered particular observations on the plan of Jones. A majority of the eight captains believed that the board should consist of three instead of five members, and that it should be chosen entirely from the navy. Several captains recommended that the senior officer of the board should preside. Captains Decatur and Shaw thought that the Secretary of the Navy should be the presiding officer. Decatur, Tingey, and Evans could see no advantage in placing the board at some central location, away from Washington. "One principal object of this arrangement," Decatur said, "ought to be to bring into the depart-

[13] State Papers, Nav. Aff., I, 322-324.
[14] Ex. Doc., 26C. 1S., No. 39, 1-2.

ment the experience and activity of a number of professional men, who should be at all times ready on the spot to furnish either Congress or the Secretary with such information as either might call for, and which their professional experience enables them to communicate." Captains Bainbridge and Stewart thought that the division of duties among the members of the board, with individual responsibility, would serve no good purpose, and that a collective responsibility and management would be much better. Captain Morris was of the opinion that the board itself should distribute the duties among its members.[18]

The suggestions of the captains tended to define and simplify Jones's plan. Their desire to exclude civilians from the board was a natural one. A board composed entirely of naval officers was likely to act more harmoniously. The captains were liberal in leaving to the Secretary of the Navy more power than he had left to himself. The wisdom of substituting collective for individual responsibility may be questioned in the light of future experience. Several years later the bureau system with individual responsibility was adopted. Congress followed many of the recommendations of the captains. In one particular, however, it departed from them; it made the board entirely subordinate to the Secretary of the Navy.

On January 9, 1815, the committee on reform and retrenchment reported to the House a plan for correcting abuses in the management of the navy and for improving the organization of the department. This they digested from Jones's plan and from the replies of the captains. The committee attributed the abuses in the department to three causes: the excessive and laborious duties of the Secretary of the Navy; the want of sufficient checks on subordinate agents; and the great latitude allowed the commanders in altering, repairing, and equipping their ships. As the principal corrective for the administrative abuses, it recommended a bill "to alter and amend the several acts establishing a Navy Department, by adding thereto a Board of Commissioners." On January 21 the House passed the bill, and on February 4 after amendment it passed the Senate. On the same day the House concurred with the Senate's amendments, and on February 7 it was signed by the President and became a law.[19]

[18] State Papers, Nav. Aff., I, 354-359.
[19] Annals of Cong., XXVIII, 223, 1047-1061, 1085, 1122-1123.

This act established the Board of Navy Commissioners. It was to be composed of three post-captains, who were to be appointed by the President and to be confirmed by the Senate. The board was attached to the office of the Secretary of the Navy. Nothing in the act was to be construed "to take from the Secretary of the Navy his control and direction of the naval forces of the United States, as now by law possessed." Under the superintendence of the secretary, the board was to "discharge all the ministerial duties of said office, relative to the procurement of naval stores and materials, and the construction, armament, equipment, and employment, of vessels of war, as well as all other matters connected with the naval establishment of the United States." It was empowered to adopt rules and regulations for the government of its meetings, and to appoint a secretary, "who shall keep a fair record of their proceedings, subject at all times to the inspection of the President of the United States and the Secretary of the Navy." The ranking officer of the board was to be its president. Each commissioner was to receive $3500 a year, in lieu of wages, rations, and other emoluments, as a naval officer; the secretary was given an annual salary of $2000. The board was authorized to employ two clerks at $1000 a year each.[11]

On February 15, 1815, President Madison nominated as navy commissioners Captains John Rodgers, Isaac Hull, and David Porter; and on the next day they were confirmed by the Senate. Rodgers, the president of the board, stood second in the navy list of 1815. The ranking officer of the navy, Alexander Murray, was not qualified for the position. Before the selection of commissioners was made Crowninshield asked Rodgers to characterize the captains on shore, with a view to aiding him in choosing the board. Rodgers responded in a paper dated February 11, 1815. He described the senior officer of the navy in the following words: "Commodore Murray, although an amiable old gentleman, has not been regularly bred to the profession of a seaman; his pretensions, therefore, as a navy officer are of a very limited description." Rodgers regarded Hull as a "man of most amiable disposition; and although he does not pretend to much science, he is an excellent seaman, and at the same time he unites all the most essential qualifications necessary for such a situation." Captain

[11] U. S. Statutes at Large, III, 202-203, 231.

NAVY COMMISSIONER, 1815.

Porter was characterized as a "man of far more than ordinary natural talents, indefatigable in whatever he undertakes; and added to these, his acquirements, professional as well as more immediately scientific, are respectable." Rodgers recommended as the most suitable for commissioners either Bainbridge, Hull, and Morris; or Hull, Porter, and Morris. Madison after substituting Rodgers for Morris, accepted the latter list.

The Board of Navy Commissioners, during the twenty-seven years of its existence, had five presidents: John Rodgers, 1815-1824 and 1827-1837; William Bainbridge, 1824-1827; Isaac Chauncey, 1837-1840; Charles Morris, 1840-1841; and Lewis Warrington, 1841-1842. In the paper referred to above Rodgers described three of the officers who served as presidents of the board. He said that Bainbridge was an "excellent officer, uniting much practice with considerable theory; he is also industrious, and if there is any objection to him, it is because he feels the importance of his own abilities too sensibly to qualify him as well as he otherwise would be for a subordinate situation." Rodgers thought that Chauncey was an excellent officer, but was best fitted for a command at sea. He described Captain Morris as a man of "strong discriminating mind, of considerable science, and unites perhaps as much, if not more, theoretical and practical knowledge than any man of his age in the service." [18]

By all odds the most influential member of the Board of Navy Commissioners during its existence was Commodore John Rodgers. He left his mark upon the administration of the Old Navy as did no other officer. For more than nineteen years he served as president of the navy board. He filled this office continuously from 1815 to 1837, with the exception of a period of about three years from 1824 to 1827, when he commanded the Mediterranean squadron. For a brief time in 1825 he served as Secretary of the Navy, *ad interim*, being the first naval officer to act in this capacity. Of the officers of his time, Rodgers was the type and exemplar. He won and maintained the regard of Presidents, Secretaries of the Navy, Senators, and Congressmen. He was much admired by Thomas H. Benton, the great Senator from Missouri, who wrote an appreciative sketch of the life and character of this typical and heroic sea-officer of the old school. The following extract is taken from Benton's Thirty Years' View:

[18] Proc. of Mass. His. Soc., 2d. ser., IV, 207-208.

"My idea of the perfect naval commander had been formed from history, and from the study of such characters as the Von Tromps and De Ruyters of Holland, the Blakes of England, and the De Tourvilles of France—men modest and virtuous, frank and sincere, brave and patriotic, gentle in peace, terrible in war; formed for high command by nature; and raising themselves to their proper sphere by their own exertions from low beginnings. When I first saw Commodore Rodgers, which was after I had reached senatorial age and station, he recalled to me the idea of those model admirals; and subsequent acquaintance confirmed the impression then made. He was to me the complete impersonation of my idea of the perfect naval commander—person, mind, and manners; with the qualities for command grafted on the groundwork of a good citizen and good father of a family; and all lodged in a frame to bespeak the seaman and officer.

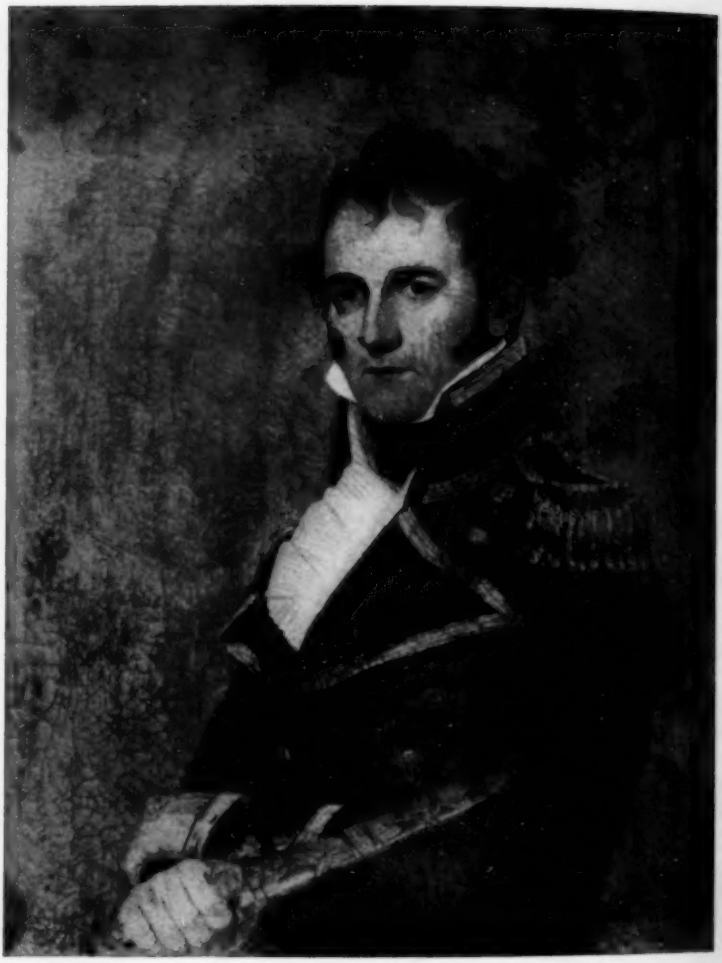
"His very figure and face were those of the naval hero—such as we conceive from naval songs and ballads; and, from the course of life which the sea-officer leads—exposed to the double peril of waves and war, contending with the storms of the elements as well as with the storm of battle . . . . Commodore Rodgers needed no help from the creative imagination to endow him with the form which naval heroism might require. His person was of the middle height, stout, square, solid, compact, well-proportioned; and combining in the perfect degree the idea of strength and endurance with the reality of manly comeliness, the statue of Mars, in the rough state, before the conscious chisel had lent the last polish. His face, stern in outline, was relieved by a gentle and benign expression, grave, with the overshadowing of an ample and capacious forehead and eyebrows."[19]

The navy board held its first meeting on Tuesday, April 25, 1815. Its manuscript journals inform us that "on this day Captains Rodgers, Hull, and Porter met and read their commission as commissioners of the Navy of the United States." The commission of the president of the board, which was signed by Madison and Crowninshield, read as follows:

"To all who shall see these Presents, Greeting:

"Know ye, That in pursuance of an Act of Congress, entitled 'An act to alter and amend the several acts for establishing a

[19] Benton, Thirty Years' View, II, 144-145.



COMMODORE DAVID PORTER, U. S. N.
NAVY COMMISSIONER, 1815-1823.
(From a portrait at the Naval Academy.)

Navy Department, by adding thereto a board of Commissioners,' passed on the seventh day of February, one thousand eight hundred and fifteen, and of the special trust and confidence reposed in the patriotism, integrity, and abilities of John Rodgers, a post-captain in the navy of the United States, I have nominated, and by and with the advice and consent of the Senate, do appoint him a Commissioner of the board aforesaid, to have and to hold this appointment, with all the powers, privileges, and emoluments, thereunto legally appertaining, during the pleasure of the President of the United States, for the time being."

After the commissions had been read, "Captain Rodgers, holding the oldest commission as a Captain in the Navy, took his seat in conformity to law as President of the Board; which then went into an examination of the merits of the different candidates for the office of secretary and clerks to the board, and elected Lyttleton W. Tazewell for the former, and Charles W. Goldsborough and Charles G. DeWitt for the latter. The board then, being properly organized, reported themselves ready to receive such communications from the Hon. Secretary of the Navy as he might have to make to them, relative to the Navy Department of the United States; and adjourned to meet to-morrow at 10 o'clock a. m."

On the next day the board adopted rules for its government. It fixed its office hours from 10 a. m. to 3 p. m. No member of the board or person attached to it was to absent himself from the District of Columbia without its consent. So far as practicable all business was to be presented to the board in writing.[39]

Tazewell declined the appointment of secretary. The place was then offered to James K. Paulding, of New York, who accepted it, and held it until November, 1823. He was then succeeded by Charles W. Goldsborough, the principal clerk of the board, who held the secretaryship until the board was dissolved in 1842. The clerical force of the office of the navy commissioners was gradually increased. In 1818 it consisted of three clerks, in 1824 of six clerks and a draftsman, and in 1842 of eight clerks and a draftsman.

In May, 1815, immediately after the navy board was organized, a dispute, in which considerable heat was generated, arose be-

[39] Arch. of Bureau of Construction and Repair, Journal of Navy Board, I, 6-7.

tween Crowninshield and the commissioners over their respective spheres of duty. The questions at issue turned upon the interpretation of the act of February 7, 1815, establishing the board. Its terms were so general and ambiguous that differences of opinion as to their meaning easily arose. The dispute originated in a contention of the commissioners that the Secretary of the Navy was bound to communicate to them the "destination of a squadron." Crowninshield declared that the communicating of such information was in his own discretion.[21] The claims of the commissioners amounted to the assertion of the right, under the act of February 7, to exercise control over the movements of the fleet and the personnel of the navy. Crowninshield claimed that the act gave them no such right. The settlement of the dispute decided which should be supreme in the department, the Secretary of the Navy or the navy board.

From May 22 until June 14 the board did nothing but meet and adjourn from day to day. On the latter date it received from Crowninshield a copy of a letter of President Madison setting forth the relations existing between the President and the Secretary of the Navy, and between the Secretary of the Navy and the navy board. According to Madison, the Secretary of the Navy was the organ of the executive and was responsible only to the President. The board had no immediate relation to the President. It was attached to the secretary's office, and was responsible to the Secretary of the Navy. All "ministerial duties" heretofore transacted by the secretary were now vested in the board.[22]

The actual powers of the board were determined by the interpretation that Crowninshield gave to the words, "ministerial duties." He decided that they referred to the materiel of the navy; to the building, repairing, and equipping of ships, and the superintending of navy yards, naval stations, and dry docks. Respecting the personnel of the navy, the commissioners exercised merely advisory powers. All questions relating to appointments and the detailing of officers, the movements of vessels, and the discipline of the navy were decided by the secretary. The func-

[21] Arch. of Bureau of Construction and Repair, Secretary's Letters, I, 8-9.

[22] Ibid., 11; Journal of Navy Board, 14-18.

tions of the commissioners were of a civil, rather than of a "naval" or military character. They were called upon, however, to advise the secretary upon "naval" matters. The secretary and the commissioners communicated with each other both orally and in writing. In all important business the commissioners first received the consent of the secretary before proceeding with it. They were, however, allowed their own discretion as to the manner in which they performed their work. They kept the secretary informed upon the work of their office.

A dispute also arose between the board and the chief clerk of the department over their respective duties. This was decided in favor of the latter. These inevitable disagreements were soon settled, and the administrative machine ran for a long time with much smoothness. When John Branch, Jackson's first naval secretary, came into the department some friction again occurred between the secretary and the board. Branch wished to limit the commissioners' powers, and to take upon himself the responsibility for many details, which former secretaries had placed upon the commissioners. This difficulty was removed with the resignation of Branch. The succeeding secretaries followed the old routine.[23]

For a short time the Navy Department consisted of three administrative divisions, the office of the secretary of the navy, the office of the navy commissioners, and the office of the accountant of the navy. On March 3, 1817, the latter office, whose personnel then comprised the accountant of the navy and thirteen clerks, was abolished; and its duties were vested in the office of the fourth auditor of the treasury, which was now established under the Treasury Department.[24] The concentrating of the work of auditing the accounts of the government in the Treasury Department had been recommended by Albert Gallatin as early as 1802. Constant Freeman, who in March, 1816, had succeeded Thomas Turner as the accountant of the navy, was now made fourth auditor of the treasury.

The offices of the third and fourth auditors of the treasury were for a long time in the building of the Navy Department, in Wash-

[23] Navy Comms. Letters, Navy Dept. Arch., 1831, I, 72; Commodore Morris' Autobiography, 89-90.

[24] U. S. Statutes at Large, III, 366-368.

ington. After the British burned the capital in 1814, the department had obtained temporary quarters. By 1816 the "old war office" had been reconstructed, and it was once more occupied by the State, War, and Navy Departments. About January, 1820, the State and War Departments moved into new buildings that had been erected for them, leaving the Navy Department in full possession of the old war office. This in time was called the "old Navy Department building," or sometimes in official documents the "Southwest Executive building." The navy commissioners, who before 1820 had been renting a small house of five rooms for their office, moved into the old war office. Both the secretary and the commissioners occupied the second floor of this building. By 1842 the need of the department for additional quarters was very great. Secretary Upshur said that owing to insufficient space the records of the department could no longer be filed away or be otherwise arranged, and were scattered here and there in confused piles. The chief naval constructor occupied a small inconvenient room in the garret, which was so dark on cloudy days that he could not see to work, and which, when certain winds prevailed, was "liable to smoke."[25]

The only Navy Department building was about two hundred yards west of the White House. It was built of brick, and was one hundred and sixty feet long and fifty-five feet wide. It was originally two stories high, with a basement and an attic. It was divided throughout its length by a broad passage; and in the center of the building was a "spacious staircase." An observer who walked through the offices of the government in 1830 was "impressed with favorable ideas of the system and order with which the affairs of this great people are conducted. The heads of the departments, with 250 clerks, occupy these buildings. They exhibit no sinecure places, but all are engaged in the business of their employments, and with as little of relaxation as is compatible with a due attention to health."[26] In 1842 the entire personnel of the Navy Department in Washington, Secretary of the Navy, commissioners, clerks, messengers, and all, numbered about thirty men.

[25] Cong. Letters, Navy Dept. Arch., VIII, 428.
[26] Elliott, Ten Miles Square, 164.

THE NAVAL MATERIEL.

During the period 1815-1842 the problems relating to the naval materiel were more successfully handled than those relating to the naval personnel. For this success the Board of Navy Commissioners deserves credit, for it was specifically charged with the administration of the materiel of the navy. It was easier to obtain legislation respecting ships, navy yards, and dry docks than legislation respecting officers and seamen, for the former was often to the advantage of local interests, while the latter was generally not. In legislating for the materiel Congress was, as a rule, liberal and intelligent. While on the other hand, many of the best recommendations of the department regarding the officers and seamen Congress refused to adopt. The influence and traditions of parties and politicians had their effect upon both classes of legislation.

The Republican party came out of the War of 1812 with a considerable momentum in the direction of naval expansion. By 1820, however, its enthusiasm for the navy had perceptibly cooled. Slavery had begun to localize its interests and to lessen its concern for national institutions. The Whig and Democratic parties, which were formed during the period 1825-1833, manifested certain differences in naval sentiment. The Whigs, inheritors in a way of Federalist principles, inclined towards a strong navy and large naval expenditures; and the Democrats, influenced by Republican traditions, favored a more moderate naval establishment. While this division of opinion is always perceptible it is not always sharply defined. The administrations of John Quincy Adams and of Harrison and Tyler were especially disposed to favor the navy; and made many attempts, more or less successful, to increase and better it. On the other hand, the intervening administrations of Jackson and Van Buren showed less zeal for the navy, although they were by no means indifferent to its needs. Jackson early in his administration wished to reduce the naval expenditures; and in his first annual message he recommended that the building of large ships be discontinued, and that the country look for its naval defense in the possession of ample materials ready to be made into ships in case of war. Later he became more liberal, and the naval expenditures towards the end of his administration exceeded those under Adams. Van Buren was friendly to the navy, but

much less so than Harrison and Tyler. During the period 1815-1842, New England continued to be more interested in the national marine than the Southern States, and likewise the Eastern States more than the Western.[27]

From 1815 to 1835 the annual naval appropriations were usually more than three and less than five million dollars. In 1821, 1823, and 1824, owing to a reaction against the navy, they fell slightly below three millions. In 1836, for the first time since 1815, they exceeded five millions. From 1836 to 1842 they remained continuously above that sum. The high-water marks were reached in 1837 and 1841, when the annual naval appropriations were respectively $7,465,000 and $7,420,000. The naval expenditures were highest in 1842, when they were $8,275,000.[28] The increased cost of the navy during 1836-1842 was caused by various circumstances: the expansion of the country and its commerce made it necessary to keep more ships in commission; the building of a steam navy was begun; the critical state of our foreign relations seemed to demand the augmenting of the navy; an expensive exploring expedition was sent out in 1838; and an act of 1835 increased the annual salaries of the officers and seamen some eight hundred thousand dollars. Levi Woodbury once ascribed the beginning of the naval increase to an overflowing national treasury.

The Republicans inaugurated their policy of naval expansion in time of peace by the passage, on April 29, 1816, of an "act for the gradual increase of the navy of the United States." This appropriated $1,000,000 annually for eight years, and authorized the building of nine line of battle ships and twelve 44-gun frigates.[29] This act was one of great importance and far-reaching influence. It definitely committed the United States, now for the first time, to the policy of building up a fleet in time of peace, and of establishing a navy comparable to those of the European nations. Its program of naval construction was larger than any hitherto planned by the department, even in time of war. The Secretary of the Navy decided to build the new ships at the navy yards,

[27] Benton, Thirty Years' View, II, 452; Richardson, Messages and Papers of the Presidents, II, 459.

[28] Ex. Doc., 45 C. 1S., No. 3, 156.

[29] U. S. Statutes at Large, III, 321.

since experience showed that better vessels could be built by the government than by private ship-builders.

The construction of the first of the nine 74-gun ships, the *Columbus*, was begun at the Washington navy yard in May, 1816; and she was launched in March, 1819. Work on the remaining vessels was commenced as follows: at Norfolk, the *Delaware* in 1817, and *New York* in 1820; at New York, the *Ohio* in 1817; at Philadelphia, the *North Carolina* in 1818, and *Pennsylvania* in 1821; at Boston, the *Vermont* in 1818, and *Virginia* in 1822; and at Portsmouth, the *Alabama* in 1819. Progress in the building of some of these vessels was very slow. The *Vermont*, *Virginia*, *New York*, and *Alabama* were still on the stocks in 1842. The *Virginia* and *New York* were never launched. The former was sold on the stocks in 1873, and the latter was burned by the Unionists on the evacuation of the Norfolk navy yard in 1861. Some notion of the size of these lines of battleships may be obtained from the dimensions of the *Ohio*. She was 198 feet long, 54 feet wide, and 15 feet deep. Her tonnage was 2170 tons. The *Pennsylvania*, at first intended to carry 74 guns, was finally built for 120 guns. She was the largest sailing ship in the Old Navy. In 1827 President John Quincy Adams, who went aboard her at Philadelphia, wrote that she "was said to be the largest ship that will float upon the ocean. She is built chiefly of live oak, and looks like a city in herself." From 1819 to 1826 the construction of nine 44's was begun. Work upon them proceeded very slowly, and several were still uncompleted in 1842. The first of them to be launched were the *Potomac*, in 1821; *Brandywine*, in 1825; and *Columbia*, in 1836. These three ships were built at the Washington navy yard. In size and architecture the ships of the line and the frigates built under the navy commissioners compared favorably with the ships of the European navies.[20]

Early in 1820 a movement in behalf of naval retrenchment developed in the House. The navy commissioners, being called upon to give their opinion upon the expediency of diminishing the annual expenditure of one million dollars for the increase of the navy, begged leave to "decline recommending a suspension, even for a limited time, of any portion of the appropriation for the

[20] Cong. Letters, Navy Dept. Arch., IV, 423-424; J. Q. Adams, Memoirs, VII, 331.

gradual increase of the navy"; and Secretary Thompson agreed with them. Towards the end of the year the House again took up the subject; and when the commissioners and the secretary were again called upon for information, they yielded to the rising opposition to the navy, and said that the time for building the ships fixed by the act of April 29, 1816, might be extended three years. Accordingly on March 3, 1821, this act was so changed that instead of appropriating one million dollars for the remaining three years that the act had to run, five hundred thousand dollars was appropriated annually for six years. In 1827 and again in 1833 Congress voted five hundred thousand dollars annually for six years for the improvement of the navy.[21]

Various other measures besides the above-mentioned ones were passed by Congress, authorizing the construction or purchase of ships. For instance, on March 3, 1825, five hundred thousand dollars was appropriated towards the construction of ten sloops of war. Several small vessels, rigged as sloops or schooners were added to the navy from time to time. About 1827 a 44-gun frigate, the *Hudson*, was purchased. In 1816 the navy contained 41 vessels, carrying 1178 guns; and in 1842, 56 vessels, carrying 2002 guns. These figures disregard all small craft below ten guns. The increase in the size of the ships was relatively greater than that in their number. Counting vessels upon the stocks and those in and out of commission, the navy in 1816 contained five 74's and five 44's; and that of 1842, one 120, ten 74's, and fourteen 44's. Only about one-half of the total naval force was placed in commission. In 1822, 27 vessels, mounting 358 guns were in commission; and in 1842, 32 vessels, mounting 850 guns.[22]

For several years after the War of 1812 the *Fulton the First* was the only steam vessel in the navy. She blew up in 1829. In 1822 the *Sea Gull*, a steam galliot of 100 tons, was bought. The second steamship to be built was the *Fulton the Second*, whose construction was begun at the New York navy yard in 1835. Her length was 180 feet, beam 35 feet, and displacement 1200 tons. Her first commander was Captain M. C. Perry, who was an early advocate of steam naval vessels. He was a brother of Commodore

[21] State Papers, Nav. Aff., I, 651, 676; U. S. Statutes at Large, III, 642; IV, 242, 646.

[22] Navy Registers for 1816, 1822, 1841, 1842.

O. H. Perry, the hero of the battle of Lake Erie, and is himself famous for his expedition to Japan. By the late thirties the European nations were using steam vessels in considerable numbers, and their knowledge of them was in advance of ours. In 1838 Secretary Dickerson therefore sent Perry abroad to collect information on the use and construction of steamships for naval purposes. For a long time it was generally believed that naval steamships were only valuable for the defense of coasts and harbors. As early as 1826 Secretary Southard had recommended their use for this purpose.

The introduction of steamships into our navy did not assume much importance until the administration of Secretary Paulding, 1838-1841. The letters of the secretary to his friends have many amusing references to the "steam fever," as he called the movement for steam naval ships. In June, 1839, he wrote that he was "steamed to death." Paulding, whose views were confirmed by those of many naval officers, believed that the utility of naval steamships for deep-sea operations had yet to be demonstrated. The use of these vessels aroused considerable opposition among the older naval officers, who were naturally prejudiced against so great an innovation.[33] Some of the younger officers, with the confidence in novelties born of youth, warmly favored the immediate construction of a small fleet of steam frigates. Paulding finally decided "to go with the wind," but not to carry full sail (a not very happy figure of speech), and "to keep the steam enthusiasts quiet by warily administering to the humor of the times." In other words, a compromise was effected between the advocates and opponents of the steam navy, and Congress voted to build three steamships. Paulding, however, with a touch of sentiment befitting a literary man, declared that he would "never consent to let our old ships perish, and transform our navy into a fleet of sea monsters." He wrote at this time that the United States "must have some mania to excite them, whether it be a merino, a *morus multicaulis*, a canal, a railroad, or a steam mania."[34]

In 1839 two naval boards, one composed of line officers and the other of naval constructors and a naval engineer, convened in Washington to consider methods of constructing the steamships

[33] Life of Commodore Stockton (1856), 80-81.
[34] Paulding's Paulding, 277-278.

that Congress had authorized. It was concerning these boards that Paulding wrote to a friend that "according to custom we have had boards to sit and cogitate, and disagree, and compromise, so that in the end nobody will be responsible for a failure if one should take place. If they don't settle the matter soon, I shall dissolve them into empty air, and take the whole matter on my own shoulders." Upon the completion of the work of these boards, the construction of two side-wheel steam frigates was begun. These vessels were the *Mississippi* and *Missouri*. They were twin ships. Their dimensions were as follows: extreme length, 229 feet; beam, 40 feet; draft, 19 feet. Their displacement was 3220 tons. They were completed in 1842. Since the two *Fultons* were little more than floating steam batteries, the construction of the two steam frigates *Mississippi* and *Missouri* properly marks the beginning of our steam navy. Their fates were tragic. "Both underwent the doom of fire, the *Missouri* at anchor on a peaceful morning in the friendly harbor of Gibraltar; and her mate in the dead of night while attempting to pass the batteries of Vicksburg, with the din of war about her, and the fierce waters of the river whose name she bore clamoring for what the other element might spare."[85]

The first steamships were built of wood. In the winter of 1841-1842 Secretary Upshur made another innovation in our naval architecture by constructing an iron steam frigate. His reasons for selecting this material were to test its utility in shipbuilding and to encourage the development of the resources of iron in the United States. At this time but few iron steamships had been built. Upshur said that "with us the undertaking was altogether new, and we had no safe light to guide us furnished by the experience of others." The parts of the new iron steamship were made in Pittsburg, transported to Erie on Lake Erie, and there set up. This vessel was named the *Michigan*. She was launched in 1843. She was the first iron vessel that floated upon the Great Lakes. She is still in the navy.[86]

A new era in the history of the ordnance of our navy began in the fourth and fifth decades of the last century. It was marked by the application of modern science and a high order of intelli-

[85] Bennett, Steam Navy, 32-44; Paulding's Paulding, 278.

[86] Cong. Letters, Navy Dept. Arch., VIII, 438; Bennett, Steam Navy, 44-45.

gence to the designing, manufacture, and operation of guns. Larger, higher-powered, and more destructive guns began to be constructed. To protect the ships from these new cannon, armor was invented. About 1840 the first shell guns and the first pivot guns came into use in our navy. The former were Paixhans guns. They were first made about 1822 by a French artillery officer, inventor, and author, of that name. He is said to have taken up the idea of Colonel George Bomford, of the American army, who during the War of 1812 invented the bomb-cannon. In 1839 and 1840 Commodore M. C. Perry conducted at Sandy Hook and on board the *Fulton the Second* the first school of gun practice in our navy. At this time Perry also established at Sandy Hook an experimental battery, and tested Paixhans guns, shells, and hollow and solid shot. It was about 1840 that target practice on shipboard began. In 1841 Congress appropriated $550,000 for the purchase of ordnance and ordnance stores, and $50,000 for the testing of improvements in ordnance and in the construction of steamers and other war vessels. As late as 1842 shells were still a curiosity in the navy. Captain W. H. Parker writing of a voyage which he had made in that year from Madeira to Rio Janeiro says that the "shells were a great bother to us; as they were kept in the shell-room, and no one was allowed even to look at them; it seemed to be a question with the division-officers whether the fuse went in first or the sabot; or whether the fuse should be ignited before putting the shell in the gun or not! However, we used to fire them off, though I cannot say I ever saw them hit anything."[x]

Under the younger Adams the six navy yards which the elder Adams had purchased were increased to seven. Before 1819 New Orleans was the most eligible port for a naval station or navy yard on our Gulf coast. But after the purchase of Florida, Key West and Pensacola were available sites and were more accessible than New Orleans. In the days of sailing ships the two Florida ports had the advantage over New Orleans more than now. In August, 1824, Secretary Southard recommended the abandonment of New Orleans as a naval station and the establishment of a navy yard on the coast of Florida.

[x] Parker, Recollections of a Naval Officer, 20; Griffis, M. C. Perry, 146; Captains' Letters, Nav Dept. Arch., June, 1839, 14.

Accordingly on March 3, 1825, Congress passed an act authorizing the establishment of a navy yard and naval depot on the coast of Florida, and appropriated $100,000 for the purchase of a site and the making of improvements thereon. Captains Bainbridge, Warrington, and Biddle were appointed by Southard to select the site of the yard at Pensacola. They sailed from Norfolk in October, 1825, and by December had completed their work. The land which they chose already belonged to the government, and was situated about six miles from Pensacola in the vicinity of Barancas to the northward and eastward of Tartar's Point.[28] Improvements of this yard were at once begun, but for many years they progressed very slowly. In 1828 additional land adjoining the Pensacola navy yard was purchased by Southard for a live oak plantation.

Before the administration of Secretary Southard the navy yards were improved by temporary expedients, and their buildings were erected without any regard to the future and growing wants of the navy. In his annual report for 1825 Southard recommended the preparation of a general plan for each yard, prescribing the various buildings that were to be eventually erected, and establishing their location. The navy commissioners also urged the adoption of such a plan. Finally, in 1827 Congress authorized the President to cause the navy yards to be thoroughly examined and plans for their improvement to be prepared. This work fell to a navy board consisting of Captains Bainbridge, Chauncey, and Morris. It was assisted by Loammi Baldwin, a skilled engineer. It performed its task with great thoroughness, and by the end of 1828 it had prepared detailed plans for all the yards except those at New York and Pensacola. The board decided that the New York yard was not well located, and therefore prepared no plan for it. It had expected to visit the Pensacola yard in the spring of 1829, but its work was cut short by Jackson and Branch. In 1837 a naval board, of which Commodore Charles Stewart was president, drew up a plan for the improvement of the Pensacola yard. For many years the navy yards were improved in accordance with the plans that were prepared during the period of the navy commissioners.[29]

[28] State Papers, Nav., Aff., I, 951; II, 99, 728.

[29] State Papers, Nav. Aff., II, 101-102, 763; III, 53-54, 212-213; U. S. Statutes at Large, IV, 242-243; Sen. Doc., 24C. 2S., No. 1, 466.

During the War of 1812 Congress authorized the establishment of a dockyard, but owing to the many imperative duties that at this time fell to the department nothing more than the making of surveys and reports was accomplished. After the war the subject came up again. In 1821 the navy commissioners reported to Secretary Thompson that the naval service called imperatively for the construction of dry docks. Finally, in January, 1825, Southard forcibly reviewed the whole subject, beginning with Secretary Stoddert's recommendation for the construction of docks, of December, 1798. "It is a remarkable circumstance," Southard wrote, "that, holding the naval rank which we do among the naval powers, we should not have one dock for the repairs of the vessels in which we take so much pride; and that we are in this respect behind every other nation, however inferior in naval strength." He recommended the building of two docks; one at Boston and the other at Norfolk.* On March 3, 1827, Congress provided for the erection of two docks, one to the north, and the other to the south of the Potomac. Southard at once engaged Loammi Baldwin to superintend the work of construction. For his services Baldwin was allowed a salary of four thousand dollars a year, eighty dollars a month for board, and fifteen cents a mile for travelling expenses. He was one of the most distinguished civil engineers of his time. His technical skill and knowledge found an ample field for their employment in the construction of the two docks, which was a work of considerable magnitude and difficulty, according to the prevailing standards.

The department decided to build one of the docks at Boston, and the other at Norfolk. Work upon them began in 1827, and was continued for seven years. The docks were first used in June, 1833, although they were not entirely completed until about a year later. They were of about the same size. The extreme length of the Boston dock was 341 feet, and its extreme breadth 100 feet. Its inner chamber, which ordinarily was the only one used in docking, was at the top 253 feet long and 86 feet wide. New England granite was used in constructing its main walls. Its stone floor was 5½ feet thick. It cost $677,000. The Norfolk dock cost $944,000. A variety of circumstances caused this differ-

*State Papers, Nav. Aff., I, 366, 434, 486, 735, 1032.

ence. The Norfolk dock was inconvenient to the quarries of granite, and the work of excavating was exceedingly difficult.[41]

The first vessel to enter a drydock in the United States was the line of battleship *Delaware*, which was received in the Norfolk dock on June 17, 1833, the anniversary of the battle of Bunker Hill. Exactly one week later the historic ship *Constitution*, under most impressive circumstances, entered the Boston dock. In accordance with the orders of the commandant, all the officers of the Boston yard assembled in full dress to witness the event. Vice-President Van Buren, Secretary of the Navy Woodbury, and Secretary of War Cass were present. President Jackson was expected, but he was detained at home by illness. A large crowd of people added life and color to the scene. Commodore Isaac Hull appeared once more upon the deck of the *Constitution*, the man and the vessel that "first broke the charm of British naval invincibility on the ocean."[42]

During the period of the navy commissioners the several navy yards grew in importance. From 1825 to 1842 the expense of running them increased forty per cent; and the number of commissioned and warrant officers attached to them, more than one hundred per cent—that is, from eighty officers to one hundred and seventy.[43] In 1836 a rope-walk was established at the Boston yard. Owing chiefly to their greater accessibility the Boston, New York, and Norfolk yards did most of the repairing and equipping of ships. The Pensacola yard took no part in the work of shipbuilding. After 1825 the Washington yard did little shipbuilding. As a naval rendezvous, depot, and repair shop, it never regained the rank among the yards, which it lost during the War of 1812. After the war, vessels were chiefly laid up and repaired at the yards convenient to the sea. The Washington yard came to engage largely in the manufacture of articles of naval equipment—cables, cambooses, anchors, blocks, castings, and laboratory stores.

Under the commissioners the administrations of the commandants of the yards were on the whole uneventful. Captain Thomas Tingey, who with two or three slight intermissions had

[41] State Papers, Nav. Aff., IV, 29, 370-371.
[42] Preble, Boston Navy Yard, MS., 212-226.
[43] Cong. Letters, Navy Dept. Arch., X, 188-189.

had charge of the Washington yard since its establishment in 1800, died in 1829, and was succeeded by Captain Isaac Hull. After having served for a few months as navy commissioner, Hull had in 1815 been appointed commandant of the Boston yard. He remained in this position until 1823. In 1822 his conduct was investigated by a court of enquiry, of which Commodore John Rodgers was president. He was accused of appropriating public property and the services of some of the employees of the yard. The court found some of his acts incorrect and indiscreet, but pronounced his conduct in general "correct and meritorious." With the coming of Jackson to the presidency, politics became an important factor in the selection of commandants, mechanics and laborers. In 1831 Secretary Branch summarily removed Captain William Bainbridge from the Philadelphia yard for writing a letter that was considered disrespectful to Amos Kendall, fourth auditor of the treasury, and a warm friend of Jackson. Bainbridge criticised Kendall for refusing him compensation for certain extra services. In 1833 Captain J. D. Elliott, who was an ardent and enthusiastic supporter of Jackson, was made commandant of the Boston yard. Elliott was a strict disciplinarian. He was arbitrary, and restlessly active. He instituted a series of changes in the regulations of the yard. His stormy administration was marked by collisions with his officers and the citizens of Boston, with both of whom he was very unpopular."

THE NAVAL PERSONNEL.

From 1815 to 1842 the principal duty of the navy was the protection of American citizens and commerce in foreign ports and seas. Next in importance was its work in suppressing piracy. Indeed, its cruises against the West India pirates from 1821 to 1826 constitute the chief "naval war" of the period. The only other war was that against the Algerines in 1815-1816. For the most part, the period of the navy commissioners was a peaceful one, and the duties of the navy were such as fall to it in times of peace.

Under the commissioners the fleet was for the first time divided into squadrons. There was a fleet in the Mediterranean during the war with Tripoli in 1801-1806, nor was it entirely

"Preble, Boston Navy Yard, MS., 211-255.

withdrawn until a few years after the close of that war. From 1810 to 1814, however, American interests in these waters were practically unguarded. In 1815 two fleets, one under Decatur and the other under Bainbridge, were sent against the Algerines. From this time onward our ships were regularly stationed in the Mediterranean. Bainbridge's flagship was the *Independence*, 74, the first line of battleship to show the American colors in European waters. In 1816 Commodore Isaac Chauncey succeeded to the command of the fleet on the Mediterranean station. His flagship was the *Washington*, 74. In 1818 he was superseded by Commodore Charles Stewart, whose flagship was the *Franklin*, 74. These three vessels were the first American line of battleships to be placed in commission.

The first ship of our navy to double Cape Horn and penetrate into the Pacific was the *Essex*, Captain David Porter, in February, 1813. The *Essex* was then on her famous cruise in the Pacific Ocean after English whalemen and merchantmen. In 1817 the United States sloop-of-war *Ontario*, Captain James Biddle, was sent to the Columbia River to assert peacefully the sovereignty of our country over the adjacent territory. The next vessel to visit the Pacific was the *Macedonian*, Captain John Downes. The establishment of the Pacific station may be dated with the ordering of Commodore Charles Stewart to the west coast of South America in 1821. The occasion of Stewart's mission was the revolt of Spain's South American colonies and the consequent need of protection of our whaling and commercial interests in the Pacific. His flagship was the *Franklin*. Stewart returned in 1824. Being accused of misconduct by the government of Peru, he was tried by a court-martial shortly after his return to the United States. The court acquitted him. Stewart was succeeded in the command of the Pacific station by Commodore Isaac Hull.

The first commander of the Brazil squadron, which was permanently established in 1826, was Commodore James Biddle. The West India squadron properly dates from the suppression of piracy in the West Indies in 1821-1826. As early as 1816, however, Commodore Charles Morris was placed in command of the naval force on the New Orleans station, and ordered to protect American commerce in the Gulf of Mexico. The three commanders of the West India squadron from 1822 to 1826 were, respectively, James Biddle, David Porter, and Lewis Warrington.

The first American naval vessel to visit the East Indies was the *Essex*, Captain Edward Preble, in 1800. In 1829 and 1830 the *Vincennes*, Master Commandant W. B. Finch, visited the Society Islands, Sandwich Islands, Macao, Manila, and the Straits of Sunda. In 1831 the frigate *Potomac*, Captain John Downes, was sent to Sumatra to redress an injury that the natives had committed against American merchantmen. Not until 1835, however, was the East India squadron established. It then consisted of two vessels, the sloop *Peacock* and the schooner *Enterprise*, and was commanded by Commodore E. P. Kennedy. Under the act of March 3, 1819, establishing an agency for recaptured negroes on the west coast of Africa, the United States corvette *Cyane*, Captain Edward Trenchard, sailed in 1820 for Africa with the ship *Elizabeth*, which carried out eighty-nine colonists. From this time it was customary for our naval ships to visit the African coast and to engage in the suppression of the slave trade, but not until 1843 was the African squadron organized. Although our naval vessels often cruised along our coasts, a "home squadron" was not established until 1841. Provision was made for it in an act of Congress of August 1 of that year, according to which the squadron was to consist of eight vessels.

In addition to employing its ships on the several stations that have been enumerated, the department often detailed one or more vessels on special duties, such as surveying the coast of the United States, guarding the live oak reservations, protecting the Newfoundland fisheries, and conveying our diplomatic representatives abroad. The latter duty was for many years a very common one. For instance, in 1823, the frigate *Congress*, Captain James Biddle, carried Hugh Nelson to Spain, and Cæsar A. Rodney to Buenos Ayres, two newly-appointed American ministers. In 1825 the frigate *Brandywine*, Commodore Charles Stewart, was selected to make the voyage to France with Lafayette, who was returning home after his memorable visit to the United States. In 1838 an exploring expedition, under the command of Lieutenant Charles Wilkes, sailed for the Pacific Ocean. Both before and after the War of 1812 a few small vessels were kept upon the American Lakes. The arrangement of 1817-1818 between the United States and Great Britain limited the naval armament on these lakes of each of the two contracting countries to four small vessels—one on Lake Champlain, one on Lake Ontario, and two on the upper lakes.

The chief increase in naval ships during 1815-1842 was made in the first half of the period. On the other hand, the number of officers and seamen in the navy decreased during the first part of the period, but increased during the latter part. Immediately after the War of 1812 the policy of the government was to build ships for future wars, but not to provide them with officers and seamen. These were to be obtained when a war arose. In the latter part of the period, however, the needs of commerce, the fitting out of a costly exploring expedition, the uncertain foreign relations, and the policy of rapid naval expansion begun by the Harrison-Tyler administration, caused a considerable increase of the naval personnel.

The first estimate for the navy on a peace footing that was made after the war of 1812-1815 provided for 7386 officers and seamen. In 1816 the total naval force was 5540 men. In 1822 and 1823 it fell to about 4000 men—the low-water mark. From the latter date until 1837 it increased very slowly. From 1837 to 1842 it increased rapidly from 6250 to 11,250 men. The total number of line officers, from midshipman to captain, in 1818 was 645; in 1842, 951. The number of captains, the highest rank in the navy, varied as follows: 1818, 34; 1822, 31; 1835, 37; 1837, 40; 1841, 55; and 1842, 68. In March, 1817, the number of officers and privates in the marine corps was fixed by law at 915; and in June, 1834, this number was raised to 1287.[45]

During the period of the navy commissioners the number of officers and seamen in the navy was not definitely fixed by Congress. Of course, the amount of money that Congress appropriated for "naval pay" roughly limited this number. The Peace Establishment Act of 1801 had fixed the number of officers in each of the higher grades of the navy, but during the War of 1812 this restriction was removed and the fixing of numbers was left to the President and the Secretary of the Navy. Under the commissioners there was great need for a statute completely organizing the navy, and thus making certain and definite many points that remained uncertain and indefinite, and providing the department with established and uniform guides to its conduct. Various

[45] Cong. Letters, Navy Dept. Arch., II, 367, 373; III, 43-44; VIII, 376; X, 179; Navy Registers for 1818, 1822, 1835, 1837, 1841, 1842; U. S. Statutes at Large, III, 376-377; IV, 712-713.

plans for a naval peace establishment were proposed at different times. In January, 1824, Southard submitted a plan which authorized the employment of 5760 officers and seamen in the several grades that he prescribed; and in 1830 Branch proposed to diminish the personnel of the navy to the number actually required in the service.[a]

The frequency and time of appointments and promotions depended in large measure on the President and Secretary of the Navy. When an officer died, or when one was promoted, the President could either fill or leave unfilled the vacancy thus created; and he could at will add additional numbers to any grade. For these reasons appointments and promotions were very irregular. From 1818 to 1824 only one captain was appointed; but in 1825, nine. In 1836 five lieutenants were appointed; and in 1837, forty-nine. Adams in 1828 chose somewhat more than one hundred midshipmen; and Jackson in 1830, one-tenth as many. In February, 1829, Adams appointed more than fifty midshipmen, and gave grounds for Jackson's belief that he filled up this grade in order to cheat the Democrats of their spoils. This irregular method of making appointments and promotions disregarded completely the proper ratios that should exist between the numbers in the higher and the lower grades of the navy.[b]

In expanding the navy list no administration equalled that of Harrison and Tyler. This may be seen by comparing the list of 1841 with that of 1842. The captains increased from 55 to 68; commanders, 55 to 96; lieutenants, 288 to 328; pursers, 53 to 64; and chaplains, 13 to 24. The enlisted men of the navy were increased proportionately. Secretary Upshur was a warm advocate and promoter of naval reform and expansion. He set as the goal that the American navy should reach, "half the naval force of the strongest maritime power in the world." Upshur's policy aroused vigorous opposition in Congress, even among the Whig members. John Quincy Adams regarded the naval program of the Secretary of the Navy as absurdly extravagant. The opposition of the Democrats in the Senate was led by Thomas H. Benton and Ex-Secretary of the Navy Levi Woodbury. Alarmed at the use which the President had made of his discretionary power to increase the

[a] State Papers, Nav. Aff., I, 1906; III, 541.
[b] Navy Registers from 1818 to 1837.

navy, Congress decided to limit him in this respect. It therefore placed a proviso in the naval appropriation bill of 1842 fixing the maximum number of midshipmen at the number in that grade on January 1, 1841; and the maximum numbers of all other grades at their respective numbers on January 1, 1842.[46]

Throughout the period 1815-1842 the subject of higher ranks for the navy was agitated. In February, 1815, Secretary Crowninshield directed the attention of the House to a bill "for erecting the rank of admiral in our naval service." It appeared to him that this measure, which had already received the sanction of the Senate, was "necessary, not only as the means of furnishing commanders of proper rank for our squadrons; but as the means of bestowing professional distinction and reward upon the veterans of the navy." The recommendation of Crowninshield, as well as similar ones of subsequent secretaries, was disregarded by Congress. The favorable reports of the navy commissioners, the eloquent appeals of brilliant young officers, and the pointed arguments of journalists, were equally in vain. In 1824 Southard in his plan for a peace establishment provided for one vice-admiral, two rear-admirals, and three commodores. With many people, however, a large navy was unpopular, and many prejudices against the service still existed. To some the word "admiral" savored of royalty, and its use in the American navy was felt to be contrary to democratic principles. Moreover, questions of more importance than those of naval rank, such as the questions involved in the contest over slavery, were pressing for solution, and occupied the time and attention of Congress. Many members of that body did not appreciate the value to the navy of higher ranks, nor the evils that the withholding of them caused: the stagnation of promotions, the sapping of the officers' ambition, the impairing of discipline, and the indignities and embarrassments suffered in foreign countries.[47]

There were many drawbacks to service in the Old Navy. Regarding the bad effects of the infrequency of promotions, James Fenimore Cooper wrote in 1839 that "when young men, in particular, are condemned to pass fifteen or twenty years in the same

[46] Navy Registers for 1841 and 1842; Sen. Doc., 27C. 2S., No. 1, 381; Cong. Globe, XI, 630-634, 638-642; U. S. Statutes at Large, V, 500.

[47] Cong. Letters, Navy Dept. Arch., II, 367; State Papers, Nav. Aff., I, 910.

rank, the spirit grows weary, the character loses its elasticity, the ambition is deadened, and the duty that with a proper attention to these details might be rendered attractive becomes monotonous and discouraging."[50] The navy was more or less rent by cliques. The Perry party hated the Elliott party; and the Barron faction was at swords' points with the anti-Barron faction. The inferior officers accused their superiors of applying or withholding the laws of the navy according to the dictates of convenience and prejudice. Lieutenant M. F. Maury wrote in his figurative and lucid style that the "laws of the navy are kept in two vials—one of which is closely sealed, and seldom permitted to be opened—the other, large-mouthed and convenient, ready at all times with its wrath to be emptied upon the younger, and therefore the weaker and more frail members of the corps."[51] The attempts of the department to enforce discipline were at times counteracted by Congress; for, when an officer was cashiered, or passed over in making promotions, a party was organized in that body to "see him righted." Secretary Paulding clinched his fists and set his teeth in his determination to restore discipline in the navy and to bring about a proper naval subordination. He made this the chief object of his administration. In March, 1839, he wrote, with a show of spirit, that the "President stands by me manfully, and please God, if I live and Congress does not counteract me, I will make both high and low, young and old, know who is their master, before I have done with them." In spite of his forcible resolution Paulding left the navy much as he found it.[52]

The typical commodore of the Old Navy was a law unto himself. He was a most austere and august personage, bluff, proud, pompous, reserved, and self-willed. "The little tyrant," Commodore David Porter called him, "who struts his few fathoms of scoured plank." Wrapped up in his own notions of dignity, he associated but little with his officers, a "solitary being in the midst of the ocean." He was surrounded with all the pomp and circumstance of a royal court. His smallest movements were accompanied with great ceremony. Lieutenant A. S. Mackenzie, a writer of much charm, has described the departure of an American

[50] Cooper, History of the Navy, XXV.
[51] Southern Literary Messenger for 1841, 13.
[52] Paulding's Paulding, 274-275.

commodore from his ship at Gibraltar, about 1830: "The sailors were drawn up before the mainmast, looking with silent respect towards the hallowed region of the quarter-deck. Upon this spacious parade-ground, flanked by a double battery, a company of fine-looking soldiers, with burnished and well-brushed attire, were drawn up to salute the departure of the commander. A splendid band of music, dressed in Moorish garb, was stationed at the stern, and the officers were all collected for the same purpose upon the quarter-deck, in irregular groups of noble-looking young fellows, the present pride and future hope of our country. At length the Herculean form and martial figure of the veteran commodore was added to the number. Here was the master-spirit that gave impulse and soul to the machine; a thousand eyes were fixed upon him, a thousand hats were raised; and as he passed over the side, the soldiers presented arms, and the music sent forth a martial melody. I thought I had never seen any array so soul-inspiring, so imposing." [53]

Service in the Old Navy was by no means all dull sailing in the doldrums of monotony and routine. The spectacle of the old commodore leaving his ship illustrates its glamor and picturesqueness. One cannot but regret the loss of the beautiful ships with their clouds of snow-white canvas, the duel-loving officers gay and debonair in their bright uniforms, and all the elaborate ceremony and display that regulated the conduct of the members of the little sea-going monarchies. Our navy was seen at its best on the Mediterranean station, which was regarded as the choicest berth by both officers and seamen. Here naval life took on a sort of Oriental luxury and dissipation. It was all one whether the ships lay basking in the winter sunshine at sportive Mahon, or were visiting the gay capitals of the Riveria, Barbary, and the Levant. Its charm and color may still be seen from the fascinating pages of N. P. Willis's Pencillings by the Way. The reader who wishes to pursue the subject should read especially Willis's description of a ball on board the famous old frigate *United States*, at Trieste.

From 1815 to 1860 dueling was quite common in the navy. More duels were fought during these years than during all the

[53] Porter, Constantinople and Its Environs, II, 10; Mackenzie, A Year in Spain, II, 264.

others of the navy's history. Before 1815, however, the practice was common. Benjamin Franklin was of the opinion that he prevented a hostile meeting between Captains John Paul Jones and Peter Landais, in 1779. Lieutenant Richard Somers, who was a naval officer from 1798 to 1804, and who is described as "mild, amiable, and affectionate, both in disposition and deportment," fought three duels in one day.[84] These encounters usually originated in trivial and imaginary causes. The sense of personal honor among the officers of the Old Navy was so excessive and extravagant that it was often absurd. In 1840 a duel between D. D. Porter and S. C. Rowan, the former of whom later became admiral and the latter vice-admiral of the navy, was narrowly averted. They were engaged in work in the hydrographic office of the coast survey, and one day fell into a dispute over the rights of Porter to prod a table with the points of a pair of dividers, and the rights of Rowan to stop this diversion. Of the several grades of officers, the midshipmen fought duels most frequently. Niles' Register for October 1, 1825, briefly chronicles one of these encounters as follows: "Two boys, midshipmen attached to the frigate *Constellation*, amused themselves by shooting at one another, on the 22d ult., at Fort Nelson, by which one of them was killed, and the other has the pleasure to say that he has slain a brother." On the Mediterranean, Brazil, and Pacific stations our officers often fought with foreigners, and especially with foreign officers. At home they sometimes engaged in bouts with civilians. President Jackson dismissed three lieutenants for affairs with a young Philadelphia doctor, being determined to prevent dueling between officers and civilians. He remarked, however, that he would not interfere with duels "between officers whose profession was fighting, and who were trained to arms."[85]

A contributory cause of insubordination in the navy was the failure of the government to provide proper schools for the young officers. Again and again the department recommended the establishment of a naval academy. Able articles in the public prints pointed out its necessity, and many officers of the navy plead for it. But Congress was not convinced, nor even thoroughly interested in the project. John Quincy Adams and Southard urged it

[84] Cooper, Lives of Naval Officers, I, 119.
[85] Sands, From Reefer to Rear-Admiral, 40, 121.

year after year, and in 1827 had it not been for the opposition of the House, a naval school would have been established. Meanwhile schoolmasters, chaplains, and professors, at sea and on shore, by dint of discouraging efforts, under conditions that often rendered their work largely futile, instructed the midshipmen in the rudiments of navigation and mathematics. At best these spasmodic attempts to inculcate bits of elementary information, heroic on the part of the teachers as they sometimes were, amounted to mere makeshifts.

One of the most beneficial services rendered by the present Naval Academy is its weeding out of the physically, mentally, and professionally unfit. In the Old Navy this was done not at all, or else done imperfectly. The most important factor in the selection of midshipmen was political and personal influence; and many statesmen of the olden time left memorials of their families in the navy list by making midshipmen of sundry sons, grandsons, nephews, and cousins. The schooling required of applicants was most meager. They were asked to "furnish evidence that they could read and write well, that they understood the principles of English grammar, and the elementary rules of arithmetic and geography." Upon receiving an appointment a midshipman was directed to bring with him a "Bowditch and a quadrant," two articles equally indispensable in the Old Navy. Few of the young gentlemen learned thoroughly the science of their profession, but many of them became proficient in its art. At first a midshipman's duties on board ship were most elementary—such as repeating the orders of his superiors and keeping a journal of the cruise. But exigency or chance, after he had been some years in the service, might require him to perform the duties of almost any grade. "To-day, the monarch of the peopled deck, and the dignified occupant of the captain's cabin; to-morrow, the puling middie again, without authority, the mere walking echo to a trumpet of tin on the quarter-deck."

One might suppose that the Old Navy with its many hardships, its few promotions, and its poor rewards, went begging for officers. But such was not the case. The glamor and romance of a naval and seafaring life, and the paternal care and neglect that a benign and indifferent government bestows on naval officers, possesses for many persons a strange fascination. On March 1, 1835, the number of applications on file at the Navy Department

for the position of midshipman was 2355; assistant surgeon, 406; teacher, schoolmaster, and professor, 50; chaplain, 131; and secretary and clerk, 170. At this time two hundred more midshipmen were employed in the navy than the service required.[56] Secretary Paulding greatly enjoyed the diverting incidents of his duties in the Navy Department, but none more so than those connected with the making of appointments. The following plea, in which the original punctuation and italics are preserved, was once sent to him by an applicant for any office whatever: "I have now been engaged ten years in editorial life; and the thirteen years which I spent in the vocation of a pedagogue, have not been spent entirely in vain. I commenced at sixteen, and am now thirty-nine, with good health, and good morals *considering my avocations*."[57]

Beginning with the inauguration of Jackson in 1829, at each change of the federal administration, the mail of the department was flooded with the letters of new applicants for various naval positions hastening to be first to offer their services to the victors, and with the communications of former applicants taking fresh hopes of success at the prospects of the coming of a new Secretary of the Navy. In the spring of 1829 Jackson's followers besieged John Branch for naval jobs of all sorts. Several of the most enterprising expressed their desires before March 4. Some half dozen clergymen were among the first to feel a call to higher service, possibly opened to them by the victory of the Democrats; and they made known their merits for the position of naval chaplain. Branch signalized his entrance into the department by removing its chief clerk. In May two other clerks were displaced. The larger part of the clerical force of the department was, however, untouched. The naval establishment was protected by its permanent tenure, and no important changes were made in it.[58]

Although under the commissioners the condition of the naval personnel was discouraging and many valuable recommendations of the department were passed over by Congress, yet several important improvements were effected. In 1835 Congress increased the pay of the naval officers. Until this time the highest pay in the navy, that of a captain, was $100 a month. His allowance

[56] General Letters, Navy Dept. Arch., XXI, 308, 517.
[57] W. K. Paulding, ed., Tales of a Good Woman (1867), 13-14.
[58] General Letters, Navy Dept. Arch., XVII, 111-194.

for subsistence, however, raised his annual salary to a little more than $2000. The act of 1835 gave the senior captain $4500 a year; and all other captains, in command of squadrons $4000, and on shore $3500. The wages of the officers of the other grades were raised proportionately. In addition to his salary each officer was allowed one ration a day.[59]

Something was done by the department by way of schools and examinations to improve the character of the naval officer. From the establishment in 1821 on board the *Guerriere* at the Norfolk navy yard of a school for midshipmen, such schools became more common, and more regular in their sessions. In 1835 Congress fixed the salary of the schoolmaster, or professor of mathematics as he was now called, at $1200 a year. At one time four naval officers were studying at Yale college, and one midshipman at the Military Academy at West Point. In 1840 four naval surgeons were granted permission to attend the clinical lectures of the Philadelphia Hospital.

The system of examinations for entrance into the navy and for promotions from one grade to another, which is now so important a feature of the service, was introduced during the period of the commissioners. One of the first examinations for promotions was held in New York in 1819. Its purpose was to determine the fitness of some midshipmen for promotion. The board of examiners was composed of naval officers. Its president was Captain William Bainbridge. In November, 1824, in accordance with an order of Secretary Southard, the first entrance examination for surgeon's mates was held at Gadsby's hotel, in Washington. It was conducted by a board of surgeons, which was ordered to ascertain the moral character and the scientific and professional attainments of the candidates. Those doctors who wished to attend the examination had first to obtain the consent of the department. In 1828 the examining of candidates for assistant surgeons, and of assistant surgeons who were candidates for promotion, were prescribed by law. In 1835 the first examination of prospective professors of mathematics was held. It was conducted by a board composed of men distinguished for their literary and scientific attainments.[60]

[59] U. S. Statutes at Large, IV, 755-757.

[60] General Letters, Navy Dept. Arch., XV, 2; XXI, 359; U. S. Statutes at Large, IV, 313-314.

The advent of steam as a motive force of naval vessels caused the establishment of a new naval corps, that of steam engineers. On July 12, 1836, Secretary Dickerson appointed C. H. Haswell chief engineer of the steamship *Fulton the Second*, then building. He was the first engineer in the navy. In 1839 Paulding appointed a principal engineer. In February, 1842, Upshur informed Congress that he had no authority to enlist engineers "*eo nomine*, and of course they can be employed only under some other name. Their pay is unascertained and dependent on private contract, and their rank in the service, and their position in the ship, are equally undetermined." Accordingly, on August 31, 1842, Congress passed a statute organizing a corps of engineers. An engineer-in-chief was placed at the head of the corps, at a salary of $3000 a year; and a requisite number of chief and assistant engineers, not to exceed eight for each steamship, was authorized. On the day following the approval of this act, Gilbert L. Thompson was appointed engineer-in-chief of the navy. He was a lawyer, gentleman, scholar, and diplomatist; and the son of Ex-Secretary of the Navy Smith Thompson. "His engineering was purely nominal, and confined to a very prompt and efficient drawing of his salary."[41]

During the years from 1812 to 1836 when the principal sailing-ships of the Old Navy were built, the corps of naval constructors assumed greater importance than hitherto. The principal constructors during this period were Henry Eckford, Samuel Humphreys, William Doughty, Francis Hartt, and John Floyd. Eckford was an eminent naval architect, of New York city. During the War of 1812 he and Christian Bergh, another noted shipbuilder, had charge of the construction of naval vessels at Sackett's Harbor, on Lake Ontario. Eckford was the naval constructor at the New York yard from 1817 to 1820. One of his vessels was the line of battleship *Ohio*, a famous ship in her day. Owing to a disagreement with the commissioners, he left the navy. Later, he built a vessel for the sultan of the Ottoman empire, and established a navy yard in Turkey. Samuel Humphreys held the position of chief naval constructor from 1826 to 1846. He was a son of Joshua Humphreys, the chief

[41] Cong. Letters, Navy Dept. Arch., VIII, 354; U. S. Statutes at Large, V. 577; Bennett, Steam Navy, 40-41.

naval constructor under Washington and the elder Adams. Doughty was for a long time employed at the Washington yard; Grice, at the Norfolk yard; and Floyd, at the Portsmouth yard.

The Navy Department often had difficulty in obtaining enough seamen to man its ships. Few vessels went to sea in which the whole crew was enlisted for the maximum period of three years. Southard believed that the failure to procure seamen was caused by the higher wages and the stronger inducements of other sorts offered to them by the merchant service, and also by the temptations presented to them by other governments. As a remedy for the deficiency of seamen, he proposed to admit more boys into the service as apprentices, and to enter healthy and robust landsmen from the Western States, rating them as ordinary seamen. Under the commissioners it was customary to enlist foreigners of various nationalities. It was commonly said that they were more prone to insubordination than native seamen.

Captain M. C. Perry was an early advocate of the establishment of an apprentice system. He addressed a letter to the department on this subject as early as 1823, and in January of the succeeding year he drew up a plan for an apprentice system. It provided for the annual enlistment of one thousand boys to serve until of age, and to be clothed at the expense of the government. Perry believed that it would effect the reformation of many bad and idle boys and would bring into the navy native-born Americans, from whom warrant and petty officers might be drawn. In 1835 Perry addressed the department again on the same subject. In the same year John Goin, of New York city, proposed the establishment of nautical schools for boys who wished to follow the sea as a livelihood. His proposition was zealously advocated by the press, and about this time such schools were established at Baltimore and Charleston (South Carolina).[82]

In 1837 Congress passed an act establishing a naval apprentice system. According to its provisions boys between the ages of thirteen and eighteen were to be enlisted to serve until they were twenty-one. Under this law several hundred boys at once entered the navy. School-ships were established at the principal navy yards—the *Hudson* and *North Carolina* at New York, the *Colum-*

[82] Griffis, M. C. Perry, 146-151, 435-439; Officers' Letters, Navy Dept. Arch., 1824, I, No. 13; Lossing, U. S. Navy, 375-378.

bus at Boston, and the *Java* at Norfolk. The boys were also instructed on board the regular cruising ships of the navy. A visitor to the *Java* at Norfolk describes the apprentices as "neatly attired in sailors' garb and good-looking." Most of the apprentices were recruited at Northern ports. The system lasted only some five or six years. Its failure has been ascribed to the extravagant expectations of promotion which were held out to the boys by the department. When these were not realized the boys became dissatisfied and left the navy.[*]

The scientific work of the navy began in the decade of the thirties, when a decided movement towards mental and professional improvement manifested itself among the naval officers. This awakening seems to have been connected with that great intellectual and reformatory "wave" that swept over Europe and America at this time. No social group apparently was left untouched by it. Near the close of 1833 the officers at the New York navy yard, under the leadership of Captain M. C. Perry, organized the United States Naval Lyceum "to promote the diffusion of useful knowledge, to foster a spirit of harmony and a community of interests in the service, and to cement the links which unite us as professional brethren." The organization soon obtained a library, museum, and ample rooms. Its motto was *tam Minerva quam Marte,* as well for Minerva as for Mars. Out of the lyceum grew in 1836 the Naval Magazine, the first periodical in the United States conducted by naval officers. Its editor was Rev. Charles S. Stewart, a chaplain in the navy. Although a highly creditable production, it had but a brief existence, of two years. About the first of January, 1836, the American Historical Society of Military and Naval Events was organized. The beginnings of the Naval Observatory and the Hydrographic Office were laid in 1830 by the establishment in Washington of the Depot of Charts and Instruments. Here the navy began its observational work in astronomy, magnetism, and meteorology; and Lieutenants Wilkes, Gilliss, and Maury commenced their scientific careers. From 1834 to 1836 the coast survey was under the direction of the Navy Department. The first naval exploring expedition was sent out in 1838 in charge of Lieutenant Wilkes.

[*] Naval Magazine, I, 176-182; U. S. Statutes at Large, V. 153; General Letters, Navy Dept. Arch., XXVIII, 160, XXIX, 510.

Lieutenant Matthew F. Maury was the first naval line officer to write a scientific book before 1840. His "New Theoretical and Practical Treatise on Navigation," a work of no great originality, appeared in 1835. The earliest scientific book by a naval officer is believed to be one entitled "Observations on the Means of Preserving the Health of Soldiers and Sailors and on the Duties of the Medical Department of the Army and Navy, with Remarks on Hospitals and their Internal Arrangement." It was written by a naval surgeon, Edward Cutbush, for many years the senior officer of his corps; and it was published at Philadelphia, in 1808. Between 1815 and 1830 another naval surgeon, W. P. C. Barton, wrote numerous volumes relating to botany and medicine. Barton was a graduate of Princeton, a scientist and botanist of distinction, and the organizer of the naval bureau of medicine and surgery.

To certain departments of general literature naval officers are specially qualified to make contributions. Their unique life on ship-board, their varied experiences in foreign lands, and their active work in time of war, afford them much highly valuable and entertaining information. When they have chosen to do so, they have produced some delightful voyages and travels, sketches of naval life, and naval biographies and autobiographies. The beginnings of this literature were made during the period of the navy commissioners.

In 1822 appeared Commodore David Porter's journal of a cruise made in the Pacific Ocean in the *Essex* in 1813-1814; and in 1835 his most entertaining letters respecting Constantinople and its environs were published. The most attractive writer among the naval officers of his time was Lieutenant A. S. Mackenzie, of unfortunate fame in connection with the brig *Somers*. His travels in Spain are still interesting reading, and at the time of their publication were much in vogue, even in London. In 1840 he issued a life of Commodore O. H. Perry; and in 1841 a life of John Paul Jones. In the late twenties and early thirties Naval Chaplains Walter Colton and C. S. Stewart and Naval Schoolmasters George Jones (later chaplain) and E. C. Wines wrote several popular volumes describing their voyages and the life on board naval ships. In 1834 W. S. W. Ruschenberger's "Three Years in the Pacific" appeared. The author was a naval surgeon, and a prolific writer. A species of literature that fortunately or unfortunately stands alone is Midshipman William Leggett's

"Leisure Hours at Sea; Being a Few Miscellaneous Poems." This volume was published in 1825. The navy may lay some claim to the writings of James Fenimore Cooper, as he was at one time a midshipman, and he found in his naval life inspiration and information for his sea stories. His history of the navy, which was first issued in 1839, is still the authority for the period covered.

Soon after the establishment of the navy board in 1815, the commissioners revised the regulations of the navy. The commissioners' edition of the regulations of 1818 was in force for more than forty years. They also revised the regulations respecting naval uniforms. They greatly improved the financial system of the department, against which its critics fulminated from time to time. The system of procuring supplies by contract was adopted; and many valuable checks against frauds and misapplications of the public money by navy agents, pursers, and contractors were instituted. Improvements were also effected in the method of keeping the naval accounts and of making the naval estimates. Some of the beneficial changes in the financial system made by the commissioners were embodied in statutes by Congress.[a]

During the last ten years of the existence of the Board of Navy Commissioners, a growing feeling of dissatisfaction with it was manifested both in and out of the navy. Some of the adverse criticism of the board was just; but much of it fell wide of the mark. The navy board was blamed for evils, for which the navy system, Congress, or the office of the Secretary of the Navy were censurable. It had no more unsparing critic among the older naval officers than Commodore Charles Stewart. In March, 1842, in a letter to Secretary Upshur, he declared that the board had failed to meet the expectations of the navy and of the country. He thought it lacked "individual responsibility." It vacillated; and it was a fruitful source of many evils. The "absence of economy in the construction, equipment, and repair of our vessels; the diversity in their models, classes, and qualities; the incapacity of some and the worthlessness of others; the excessive waste by continual experiments, have never been surpassed, if ever equalled, in any other naval establishment of the same limits." On the

[a] Commodore Morris's Autobiography, 90.

other hand, Secretary Southard had said in 1825 that the navy board had managed its work in a way "deserving the highest commendation," and that it had superintended the expenditure of $15,500,000 without loss to the public.[65]

The public prints of the time often discussed naval reform and the reorganization of the Navy Department. In January, 1842, the Madisonian said concerning the department that "an *imperium in imperio* exists, with all the evils concomitant on such an institution."[66] In 1840 and 1841 some remarkable articles on naval reform appeared in the Southern Literary Messenger, a periodical published at Richmond, Virginia. They were entitled "Scraps from the Lucky Bag," and were signed pseudonymously, under the name of "Harry Bluff." They attracted much attention, were widely read and discussed, and were in part reprinted for the use of the members of Congress. Their author was Lieutenant Matthew F. Maury, a young man of brilliant parts, who later achieved renown for his studies and publications in meteorology and hydrography. Maury was a facile writer. His style was vivid, lucid, and vigorous. He marshalled his facts and details in a most convincing way, and wrote with the zeal of a reformer. Such notoriety did these articles gain the young lieutenant, that he was mentioned as a proper character for Secretary of the Navy.

A few quotations will give a notion of Maury's style and criticism: "The organization of the Navy Board is bad. The seeds of disease were implanted in its system from the beginning. Laboring thus under a constitutional malady, it has inflicted upon the service first one and then another of its ills, until at last the whole navy has got the *cachexia*. The friends of the patient have become alarmed; and in the consternation that prevails many and various remedies are proposed. But let us, if possible, Mr. Editor, retain our presence of mind, and attempt first to ascertain in what stage of disease the patient really is; then we may proceed to prescribe remedies with a better grace, and to treat the case with more chances of success." "Some will tell you that the Navy Board is a power behind the Secretary greater than the Secretary himself—that there is a Master-Spirit in that board, which rules

[65] Army and Navy Chronicle for 1844, 416.
[66] Army and Navy Chronicle for 1842, 24.

the Navy. Others will tell you that the evil genius of the Navy presides at that board." The navy is inflicted with an "organization quaint and *outre*, with a board of commissioners, and many a blunder and foolish notion."

Maury accused the commissioners of waste, extravagance, dilatoriness, and bad judgment, in building and repairing the public vessels; of ruinous delays in fitting out ships; of vacillation and lack of science in preserving timber; of bad accounting and of misstatements in making reports; and of attempting to abolish the marine corps. He said that no vessels had been built by the navy board comparable to those of Eckford and the elder Humphreys. The commissioners "had turned out upon the navy a nest of tubs and sent them to sea as men-of-war."[a]

Maury greatly overstated his case against the commissioners. His arguments were, of course, one-sided. They were brilliant and exaggerated. He proved too much. In common with all enthusiasts, he saw the evils of the system that he criticised, but failed to see those of the system he recommended. He overestimated the importance of an administrative system, whether it be good or bad. His papers furthered the cause of naval reform and strengthened the opposition to the navy board.

As an administrative organ the Board of Navy Commissioners was moderately successful. It displayed both the good and bad qualities of a plural-headed executive. Its acts were conservative and deliberate. The principles and information upon which it acted were well-considered. Its advice to the Secretary of the Navy when drawn from its professional knowledge was valuable and judicious. As its members were not specially trained in the art of shipbuilding, it sometimes blundered in naval construction. Its work often lacked expedition. Since each member had to reach a decision on all questions presented to it, it was sometimes slow in reaching a conclusion. When its members failed to agree, it gave forth discordant advice. Unfortunately, many of the problems that the board by reason of its professional information was best able to solve did not fall to it, but to the Secretary of the Navy.

[a] Southern Literary Messenger for 1840, 233-240, 305-320, 785-800; for 1841, 3-25, 345-379.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SYSTEMATIC PREPARATIONS FOR BATTLE.

By COMMANDER JOHN G. QUIMBY, U. S. Navy.

In this paper, the writer proposes to discuss the present lack of system and uniformity that characterizes the work of the navy at large in its preparation for battle; to show how far it has advanced toward the goal of battle proficiency; to embody and suggest remedies for present defects; to show the relative cost of the suggested system, to that of the present casual methods pursued; and, finally, by pointing out a uniform system, looking to preparedness for battle to show that the cost of system is but little more than the cost of casual methods, while the results are vastly in favor of system.

The writer will discuss the following topics as they are intimately connected with the subject under consideration—preparedness for battle—viz:

First. A standard organization for each well-recognized type of ship.

Second. A uniform standard system of collecting (and the forming and drilling during such collecting) a ship's company.

Third. When once collected and commissioned, the advantages derived from keeping that ship's company intact during such commission.

Fourth. A uniform method of procedure immediately after commissioning, in order to develop individual ship's proficiency at battle practice.

Fifth. A plea for humanity's sake, which, it is confidently expected, would make naval life more interesting, and be productive of a decrease of desertions, etc.

Sixth. Fleet tactics, and fleet battle practices.

Seventh. In conclusion, a comparison of present results with results obtainable if these suggestions are followed, with a comparison in cost.

Eighth. A final summing up.

FIRST. A STANDARD ORGANIZATION FOR EACH WELL RECOGNIZED TYPE OF SHIP.

After 1882, when the so-called "new navy" came into existence, the ships being of various types, and entirely different from any of the older ships of the service, it became necessary to rely upon the initiative of the executive officer to so organize the ship's company as to put that ship in an efficient state. This organization was, of course, merely a tentative arrangement; but the regulations, requiring a ship going out of commission to turn in her different "station bills," had the effect of rendering the first organization more or less permanent.

When such a ship was re-commissioned, a newly appointed executive officer would apply to the proper source for the old "station bills" of the ship; and, if obtainable (which was rarely the case) he would naturally work on the old organization as a basis for the new. This, as has been said, has been the plan in operation since 1882. In the meantime, from the four cruisers then authorized, the navy has increased to its present dimensions.

Types of ships have been multiplied and experimented with, until now, when the navy has finally adopted, in conformity with foreign navies, the following well-recognized types of ships, namely: Battleships, armored cruisers, protected cruisers, unprotected cruisers, gunboats, torpedo-boat destroyers, torpedo boats, submarines.

Of these eight types, all, by a process of evolution, have assumed a comparative uniformity when considered by types, but in no case, within the writer's knowledge, have any two ships of even similar type adopted the same organization.

It is patent that it is now time, after twenty-five years experimenting (allowing all executive officers almost unlimited latitude for the exercise of their ingenuity, and executive and organizing ability), that a board, composed of such of these executive officers as have shown marked abilities in the direction named, be formed; and the recommendation of this board be adopted, and

made a "standard organization." The board should be directed to make its recommendations sufficiently elastic to fit changes in different types (oddities in construction, including improvements) realizing at the same time a uniform organization for each of the present recognized types of ships. This would tend to lessen the labors of future executive officers, and the period now necessary to organize a ship's company of any type. And, moreover, any officer or man being ordered from one ship to another (a habit which has reached alarming frequency and is greatly to be deplored) would then know something of the ship's organization, and could more readily adjust himself to the situation.

The Navy Department should then have printed on paper—sufficiently large to fit the more or less standard station bill-boards—skeleton organizations, which would require only the names of the officers and men that would fit in the blank spaces.

Frequently now the various "station bills" are the results of outside men employed and paid out of the exeuctive officer's own pocket; and, moreover, in producing these more or less ornate "station bills" now exhibited on most ships, it is usually well along toward the end of the commissioning before such "bills" are ready for posting. I am referring to the usual "station bills" covering the "emergency" and "other" drills required by the regulations, viz: "fire bills," "collision bills," "coaling bills," "boat bills," "battalion bills," and the usual "watch," "quarter" and "station," "bills" for the engine-room force and seaman branch.

SECOND. A UNIFORM STANDARD SYSTEM OF COLLECTING (AND THE FORMING AND DRILLING DURING SUCH COLLECTING) A SHIP'S COMPANY.

It is further suggested that a system of organizing ship's companies of ships about to be commissioned should be uniformly adopted which would render results more uniform, and expedite greatly the period of putting ships in commission.

The writer is sure that in the following he is only repeating the general plans followed by the Navy Department in making such details, looking to the formation of a ship's company about to be commissioned.

As men become available, having yet a sufficient length of time

to serve, they are ordered to a receiving ship or barracks for duty as members of a newly, about-to-be-commissioned, ship's company. As these men reach in number and ratings the size of a division, for the new ship, officers of the junior rank are ordered to the same receiving ship or barracks to take charge of these recruits, and put them through as many of the drills usually held on board ship as the surrounding circumstances will allow, such as:—Boat drills, setting up drills, infantry drills, etc., that in no way interfere with the final organization of a ship's company, all men of the seaman branch being supposed to know such drills.

The officer who is to command the ship is usually ordered as a "general inspector" of the vessel, and receives from the "executive officer" and the "engineer officer," such suggestions for improvements as they may make or that may occur to himself after a careful inspection of the building or repairs, and suggests improvements to the department, as required by the regulations.

The "executive officer" is usually ordered to the place where the ship is building or being repaired, there he learns the peculiarities of the construction of that particular ship, then he exercises his ability to make the allowed complement of the ship fit the case, and, as soon as the ship's company becomes collected at the receiving ship or barracks before mentioned, he commences to fill in the names and ratings on a skeleton organization.

To the writer it would appear that the executive officer's place at this time is with the personnel of the about-to-be-commissioned ship's company; of course, continuing to make frequent inspections of the ship. In this way, these skeleton divisions could be formed, involving but few changes in the final organization of the personnel and giving a uniformity in the drills held by the subsequent division officers.

The "engineer officer" is also ordered to the same place as the "executive officer," and, very properly, looks after the material and construction in his department and makes out a station bill of the engine-room force allowed by the department's complement.

The "ordnance officer" should be on the same footing as the "executive officer" in the primary collecting of a ship's company, having access to the enlistment records and gunnery records, being in a position to judge of the physique, and the character of the men of the personnel. He should lend his aid:

1. To the "general inspector" at the place of building or repairs in the installation of:

(a) The battery.
(b) Ammunition hoists.
(c) Arrangement of magazines.
(d) Fire-control apparatus, etc., and

2. To the "executive officer" in the formation of:

(a) Gun's crews.
(b) General quarter exercise arrangements.
(c) Fire-control parties, etc.

The "navigator" should be ordered to the ship for the purpose of making magnetic surveys and other duties connected with his subsequent office, and giving such aid to the "general inspector" and to the "executive officer" as may materially assist them, and, at the same time be keeping in touch with the organization and personnel.

In this manner the organization of the ship's company would be intelligently formed, in accordance with the standard of the department; and made to fit the peculiarities or conditions of the ship-about-to-be-commissioned; and, when commissioned, the "station bills" would be completed, the men fairly well drilled in all the preliminary exercises tending to make that ship proficient; and, moreover, the men would have been under the direct supervision of their own officers for some time, who would know that their "clothing," and "bedding," had been thoroughly inspected and completed, and also, their personal habits and capabilities, and, it is fair to suppose, that the men would know the minute they got on board ship where they belonged and what would be expected of them.

In this manner much of the confusion usually attending the commissioning of a ship would be avoided; the personnel would at once become comfortable; the stores could be immediately started on board, checked and accounted for by the proper clerical force; and the readiness of the ship for general duty be advanced fully six months.

In this way: (1) The time now taken for the collecting of a ship's company would be turned to the utmost advantage, and, (2) the newly commissioned ships would be ready in the shortest possible time for the carrying out of the following proposed "next step" to promote that ship's general efficiency.

THIRD. WHEN ONCE FORMED AND COMMISSIONED, THE ADVANTAGES TO BE DERIVED FROM KEEPING THAT SHIP'S COMPANY INTACT DURING SUCH COMMISSION.

It is not necessary to enlarge much on this, as it is so self-evident; the officers and men should not be changed except for extreme reasons; and, as any change in the ship's complement would mean the loss of some integral part of her mechanism, the present term of three years is considered too long.

I would therefore reduce this term to two years and make it exceedingly difficult to shift officer or man. Any officer should be so indispensable on board that, to allow his being detached as long as his health remained with him, should be rendered almost impossible. This same reasoning, of course, applies to the guns' crews, gunpointers especially; it applies also, but to a much less degree, to the engine-room force, the quartermasters, etc. No change should be permitted except for vital reasons.

It is rather long to keep a ship's company intact without change for three years; but, as three years is merely the outcome of the time when men were enlisted for three years, it is not considered necessary to hold to that period. Nobody would argue that the third year of a ship's commissioning would find her less efficient than during her second year, provided, of course, that the permanency of her officers and crew were possible for that length of time; but, the difficulties of this permanency seem to increase more rapidly than the square of the time, and, moreover, recent experience of our own and other navies, seems to indicate that the life of the "equipment" of a ship is roughly about two years; and, that her piping, etc., need continual repairing and patching during the third year, which renders it advisable to have a complete refit every two years; and this is what should limit the term of commission. Much more could be said, and many more reasons advanced for this, but it is not considered vital to this paper.

FOURTH. A UNIFORM METHOD OF PROCEDURE IMMEDIATELY AFTER COMMISSIONING IN ORDER TO DEVELOP INDIVIDUAL SHIP'S PROFICIENCY AT BATTLE PRACTICE.

A ship having been commissioned in accordance with the above suggestions; or, which has followed during these preliminary months any system which will produce the results above sug-

gested, should now be able to leave the navy yard for what might be called a shaking-down cruise. The writer recommends that, acting so as to best obtain results from this fourth step, something of the following nature be rigidly adhered to: The ship has orders to leave the yard and proceed to the locality of a navy target range. By careful drill for two weeks after her arrival on the range the "team-work" should be carefully perfected.

The ordnance officer should be busy selecting—from every officer, not otherwise stationed during battle, and intelligent seamen —"spotting groups." These "spotting groups" being drilled daily at the Barr and Stroud range finders, and being thoroughly instructed in its mechanism and adjustments so as to become familiar with this method of range finding. They should also have complete instruction in both recognized methods of spotting; *i. e.*, the vertical and horizontal methods, from different heights and positions on the ship. Estimates being continually made of distances, over and short, from any given object. This could be readily drilled at by anchoring a boat three, four, or five, or even six thousand yards away, having a steam launch steaming toward the ship from the target (for shorts) or away from the ship, beyond the target (for overs). The steamer by noting the escape of steam from the ship's whistle at certain intervals could quite accurately keep a record of its distance from the boat or target at this instant. The various "spotting groups" could, in this manner, be readily classed according to efficiency in estimating these distances.

During the two weeks or more, if the commanding officer thinks advisable, these daily drills and instructions should be used to classify the different available spotters for each and every class or caliber of gun. Moreover, such drills would be of inestimable value to the different division officers, and could readily be used for drilling sight setters, and everybody that should be used in an efficient "fire-control." The ship is now in a position to have its primary practice as allowed by "Gunnery Instructions, 1905." This primary practice, should, of course, be used as it is intended to be used by those instructions; as a test of guns and mounts; for calibrating the different classes of guns; and, also for testing fire-control parties, particularly the "spotting groups." Two weeks more, at the discretion of the commanding officer, should, no doubt, be now profitably used collating the data thus acquired,

particularly the calibration before mentioned; and by correcting any defects in the "fire-control" or ordnance that may have developed during the primary practice. The ship is now ready for her preliminary practice. The importance of this practice can be enhanced by using it for further test of the "fire-control," which control is, in the opinion of the writer, considered to be by far the most essential element in successful target or battle practices.

Possibly a month at the target range has thus been used to the utmost advantage of the ship. The "dotter," "Morris tube," and "loading machines" have all been used daily to develop and bring to perfection "team-work" and "gunpointers."

The next two weeks or more, this period being lengthened or shortened at the discretion of the commanding officer, should now be devoted to sub-caliber work. The ship being under way and steaming over the prescribed range for "record practice" at speed for the larger guns, three-pounders for six-inch, and three-inch for larger calibers should be used.

A table could readily be prepared at the Ordnance Proving grounds so that correct "sight-bar range" tables could be used with the regular sights. The "spotting groups" and "fire-control" parties could be given a great test by this method, and, moreover, the engine-room force are being drilled at their stations; the quartermasters, at the helm; and, the "gunpointers" and "guns' crews" will readily appreciate what is to be done at the next test to which they are to be subjected. There is no doubt, in the writer's mind, that sub-caliber practice of this kind has never been given the proper place of importance. It is of as much importance in developing "ship-work" as all the former drills have been in developing "team-work" in the gun units.

When the commanding officer is satisfied with this progress, the department, having been notified, will have present a sufficient number of impartial officers for judges and umpires and the ship is now ready for its record practice. All that is laid down here can have been accomplished only by a single-mindedness of purpose; "a feeling," that "the ship to which I belong must beat the record," which every true sailorman should possess, in two months' time. Record practice, or as I prefer to call it, gunlayer's test, should now be held. This record practice should be used for ascertaining the "rapidity of fire" of the turret and intermediate

guns that the team-work and ship-work have already developed. Suppose these are "forty-five" seconds for turret guns and "twelve" seconds for intermediate calibers.

The next month or six weeks should now be used by the commanding officer in developing a sub-caliber "battle practice," fulfilling, as nearly as possible, the following suggested battle conditions:

(1) A target moored on line of bearing.

(2) The ship approaching at a closing angle of about 30° for sub-caliber work.

(3) The firing should commence at a distance of not less than 3000 yards.

(4) "Distance determined by Barr and Stroud or other range finders."

(5) With the target bearing on the bow of the ship.

(6) The ship steaming at twelve knots an hour, should by fulfilling these conditions, steam one mile (actual distance 2100 yards), or for five minutes, before the target bears abeam (also a distance of one sea mile, 2100 yards).

(7) No buoys of any description are to be allowed, and no range finders, other than Barr and Stroud or similar instruments should be used.

Now, provided the turret guns of a battleship or armored cruiser are fitted with the larger sub-caliber (the 3-inch), at the signal "commence firing," which should be given at 3000 yards, the target bearing on the bow, and running at a closing angle of 30°, one twelve-inch turret sub-caliber 3-inch opens fire at a range, on a twelve-inch gun corresponding to 3000 yards, for the 3-inch. The shot is spotted, and let us suppose the turret spotter estimates 500 yards short; forty-five seconds afterwards, this same gun (having been elevated to meet this shortage, minus the shortening of the distance) fires again; this shot also falls short, the spotters estimating the distance to be, let us suppose, at the water-line of the target; clearly now, if the range be increased by the danger space of the 3-inch at present Barr and Stroud range, the next shot would carry over.

The "fire-control" party signals, therefore, an increased range of one-half this danger space, minus, of course, the shortened distance, owing to closing in, the third shot, forty-five seconds after the second shot, should clearly be a bull's-eye. The sight-

bar range is now used by all the turret guns, and the range clocks instantly set going by telephone or other signals from the fire-control officer, and the orders given for the turret guns to open fire. If the calibration (as I understand the term) has been carefully worked out, the sight-bar range thus determined for the turret guns, would give the intermediate guns their "sight-bar range," and these guns could now open fire by salvos every twelve seconds. Let us suppose that it is possible to distinguish the splash of a 3-pounder from that of a 3-inch at this distance, namely, at this time 2670 yards. The 6-inch spotter would then be able to get a center of impact of the intermediate guns on the bull's-eye. Practice of this method should develop, as it probably will, that is possible to so distinguish between the splashes.

Two and one-fourth minutes of the run were taken up we are supposing, in bringing the turret gun on the target, in other words, finding out the fighting sight-bar range; this last being agreed as the key to all naval battles, leaving of the run of five minutes, still remaining, two and three-fourths minutes, with which all guns bearing on the target which could be used at this range, during a battle, with any effect, firing as prescribed at the target as rapidly as the 12-inch and 6-inch guns themselves could be served and fired during a battle.

The writer does not have the means of figures at hand to estimate the actual cost of one of these miniature battle practices. But a rough estimate would put the total cost at the price of one 12-inch shot, or the department may safely allow four such practices during the first six months' work of the ship.

During the month or six weeks in working up for this, a ship could readily have three, or, let us say, four such miniature battle practices. The guns, now being calibrated, a ship having gone through primary, preliminary, and record practices with service charges, the commanding officer, during the remainder of his fourth month, could drill the ship at approaching this target, at double the above distance or from 6000 to 4200 yards; also doubling the time; and, keeping the speed the same, be ready for battle practice, at the end of his fourth month on the target range.

With suitable officers again sent; and, as many officers from nearby stations as can attend without injury to the service, be ordered to witness the battle practice. Until every officer in the service shall have witnessed at least one such practice.

It is respectfully urged, that, as officers of the service constitute what may be called the permanent personnel of the service, that the experience thus gained would be of so much value as to be hard to place an estimate upon it; and such experience would undoubtedly develop a "fire-control" and "battle efficiency" to such an extent that each battleship in the service, at a very conservative estimate, would more than quadruple its value. The final battle practice, conducted on the plan laid down or any similar plan as laid down by the Navy Department, should be conducted whenever the commanding officer decides and should take place during the fifth or sixth month after arrival at target range. This final battle practice as laid down here, would cost in ammunition, for any standard battleship now existing in the United States Navy, somewhere in the neighborhood of $20,000.

When it is considered that a battleship in commission represents a total cost in money of about $8,000,000 or $9,000,000; and represents the power and dignity of the country, this cost of $20,000, in money value alone, is one four-hundredth of the value of the ship. Hence, for the value of one battleship four hundred of these battle practices could be held, this small expenditure of money would seem to have been (to say the least) profitably expended.

RESUMÉ OF NUMBER FOUR.

The period during which the ship is occupied on the target range may, for reference, be divided in the following periods:

FIRST PERIOD.—*Two Weeks, Three Drills Per Day.*

GUN'S CREWS.—Organizing and drilling at guns, Morris tube work, and at dotter.

SPOTTING GROUPS.—Formation and drill as suggested by target and steamer; explanation and use of Barr and Stroud.

ENGINEER'S FORCE.—Drill at stations, learning piping and flushing systems, manifolds, etc.

One Day.

GUN'S CREWS.—Primary practice.

SPOTTING GROUPS.—Primary practice.

SECOND PERIOD.—*Two Weeks.*

GUN'S CREWS.—Continue exercise at same, using loading machine; correcting defects.

SPOTTING GROUPS.—Classification of groups and continued drill at estimating distances, etc.; using Barr and Stroud; ordnance officer calibrating.

ENGINEER'S FORCE.—Keeping department in good shape.

Three Days.

GUN'S CREWS.—Preliminary practice.

SPOTTING GROUPS.—Preliminary Practice.

ENGINEER'S FORCE.—Under way.

THIRD PERIOD.—*Two Weeks.*

GUN'S CREWS.—Sub-caliber work in preparation for record practice on regulation range.

SPOTTING GROUPS.—Drill at fire-control, using classified spotters at different calibers.

ENGINEER'S FORCE.—More or less under way.

FOURTH PERIOD.—*Two Weeks.*

GUN'S CREWS.—Continued sub-caliber work on range; awaiting umpires, then unrig sub-caliber.

SPOTTING GROUPS.—Extension of fire-control, and continuing third period.

ENGINEER'S FORCE.—More or less under way.

Three Days, or More, as Required.

GUN'S CREWS.—Record practice.

SPOTTING GROUPS.—Record practice.

ENGINEER'S FORCE.—Under way.

FIFTH PERIOD.—*Four to Six Weeks.*

GUN'S CREWS.—Rig sub-caliber, continue team-work, and occasionally using sub-caliber on battle range; miniature battle practice.

SPOTTING GROUPS.—Using every available minute perfecting fire-control when using sub-caliber on battle ranges (limited to four practices).

ENGINEER'S FORCE.—More or less under way.

SIXTH OR FINAL PERIOD.—*Two to Ten Weeks.*

GUN'S CREWS.—Using sub-caliber and preparations for, and battle practice.

SPOTTING GROUPS.—Correcting defects in fire-control; sight setters final drilling; battle practice.

ENGINEER'S FORCE.—Under way.

This is, of course, rather strenuous, but we are living in a strenuous age, and so a little strenuosity exercised in peace time, means "easy work" in war time, and counts a great deal more. Moreover, the effect of mistakes is more costly and harder to recover from in war times than in peace times, and patriotism calls for strenuosity.

It may be urged that the battle practice for battle efficiency does not fulfill the conditions likely to confront a ship in battle. In answer, the writer urges the following arguments:

(1) The ranges used are battle ranges, and

(2) Are obtained as battle ranges would have to be obtained during battle, and,

(3) Moreover, the target having been anchored, which an enemy would not be, still, the target being anchored represents more nearly the immobility of a fleet's "line of bearing"; for a single ship maneuvers many times more rapidly than a fleet composed of several squadrons or divisions.

The day for actions between single vessels is over, and such actions will now only take place in isolated cases. Will anybody deny that a ship is better fitted to fight another that can make a percentage of hits upon a target at unmeasured distances, as this practice calls for, than a ship is under that advance in target practice as now indulged in for the benefit or edification of very few of the permanent personnel.

FIFTH. A PLEA FOR HUMANITY'S SAKE, WHICH IT IS CONFIDENTLY EXPECTED WOULD MAKE NAVAL LIFE MORE INTERESTING, AND BE PRODUCTIVE OF A DECREASE OF DESERTIONS, ETC.

In considering the human side of this question, it is considered better to state that the writer has given this question the benefit of 32 years or more of close study, having been thrown, for the best part of those 32 years, in close contact with what I shall designate as the enlisted element of the service. This term is used in no sense of disparagement, but simply to distinguish what has popularly been called "the man behind the gun," from what has been designated in other parts of this paper as the permanent personnel. Not having at hand the statistics necessary for a mathematical statement, it is presumed that not one man in ten serves a second enlistment, and this is considered, for the purpose of this article to be sufficiently accurate.

The American is so constituted that he is more amenable to discipline, if he sees a reason for such discipline. Being of the Anglo-Saxon race, the easiest way to excite his interest in any particular thing, is to incite competition between him and somebody else. This last characteristic in the American has been so thoroughly understood, in recent years in the service, as to have been productive of truly marvelous results in target practice, as now conducted, where one ship is pitted for record against all others in the service. Another axiom, fairly well understood among intelligent men, is that a human being will work better where there is a hope of reward, than he will, when continually

confronted by a fear of punishment. Very often, his individual instincts would keep him in quest of reward, while the same instinct would cause him to seek escape from punishment.

Another characteristic of the American is, that he will seek pleasure and recreation, and also requires this pleasure and recreation as a rest from the labors of his adopted calling.

With these premises fairly well understood and being kept continually in sight; is it not strange that "the articles for the government of the navy" lay down with peculiar conciseness and concreteness, punishments that a commanding officer may inflict, or, that may be inflicted by a summary court-martial, and the navy regulations deal only in generalities where some corresponding reward of merit may be awarded by the same commanding officer? Thus in "the articles for the government of the navy" there are concrete punishments laid down for offenses and, in the United States navy regulations there are only the abstract generalities for rewards of merit. May I add that concrete things appeal more strongly to the average human mind than abstract things?

In the scheme laid down in this paper, as a preparation for battle, no one will deny that it will require an absolute "single-heartedness" of purpose by which the ship as a whole is actuated.

It is also essential that the commanding officer, if actuated by any ambition to succeed in his chosen profession, should act in such a manner as to impress the whole ship's company (officers and men) with his personality and such personality must be of a beneficial nature. Moreover, this personality must impress itself upon the entire personnel of the ship so as to insure a perfect harmonious working of all units, along a single line, each individual working, heart and soul, in the same channel, following the commanding officer's lead, in order that success may attend the first six, as well as future, months of a ship's commission.

It is considered by the writer, that the four to six months on the target range, with all work and no play would certainly "make Jack a dull boy," but, if five days of the week be devoted entirely to work or target practice, the remaining two days may well be put to "rest and recreation."

Looking to this end, it is suggested that the men be given to understand that, doing their duty in a whole-hearted manner for the five days (commencing Monday morning and ending Friday evening) that as a reward they will be given the remaining two

(from Friday evening until Sunday evening) as a period of relaxation and liberty; this to continue throughout the four to six months. And also, as a future reward for success attending their efforts, if the desired results are obtained in four months' time, the ship will be returned to her fitting out (or home) port, and each man who has contributed his share toward success shall be given twenty days leave under full pay; if this success be accomplished in five months, the corresponding leave will have to be reduced to ten days; if this success is not accomplished until the end of the six months, the corresponding leave will have to be reduced to five days.

In carrying out the first system of rewards, it is suggested that a suitable tender be placed at the disposal of the ship on the target range whose duties will be to take the men to the nearest center of population Friday evening and return them to the ship Sunday evening. In the meantime, during this period of forty-eight hours, this tender will be used as a home for the men on liberty, they can sleep on board, have their meals on board, go when they please, and return when they please. The only restriction being that proper conduct, looking to the comfort of all, would always be enforced; in this manner, at least every other week, one-half the ship's company will have complete recreation and rest, and they will have been returned to the ship Sunday evening, so as to insure a night's rest free of temptation, in order that they may be ready for duty and hard work Monday morning. With such a system consistently carried out, it is not believed that many absentees will be found on that ship Monday morning; it is also believed, that, by the exercise of good judgment, these weekly periods of recreation can be used by commanding officers as a means of rewarding especially deserving men. The final reward for success, must, of course, be assured by the department, to both officer and man, and the department may be confident that the men in return for such consideration will show their appreciation by making the yearly percentage of desertions less and the yearly percentage of hits more. A very rich harvest in my humble opinion.

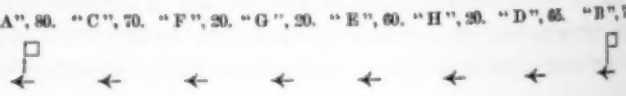
At the risk of repetition I must bring out a little stronger, the fact, that a ship always reflects the personality of her commanding officer, or, which is another way of saying it, the officers take their bearings and standards from their commanding officer, and the

men quickly take their cue from the officers. If, therefore, the commanding officer shows his subordinates the right way to develop battle proficiency, and these officers reflect his personality, the whole mechanism is started in the right channel, and work becomes harmonious; in other words, a single-heartedness of purpose, looking solely for that ship's success is put in operation, and this means "S-U-C-C-E-S-S," every letter spelled with a capital.

SIXTH. FLEET TACTICS AND FLEET BATTLE PRACTICES.

The writer does not intend to give a revised, or advanced edition of bridge whist, in writing on the above topic, but merely to touch lightly on the present status, and show how much at the mercy of this lack of system, every admiral would be, were this country suddenly to find itself facing the final arbitrament of arms.

Every naval man will accept as axiomatic that a fleet composed of various units of unknown fighting value (as would be ships which might be depended on to hit a ship or ships at anything but target range and which might not be so depended upon) would be difficult to put in their proper places to bear the brunt of battle. As in a game of chess, if a player does not know the value of his moves and units, a queen might be sacrificed for a pawn. So, in this naval battle a battleship might be sacrificed to a poor little despised torpedo boat, and for the same reason, because the admiral did not know her value (not in money but fighting efficiency). Therefore, let us suppose that the admiral does know the ships of his squadron, of, let us say, eight battleships called A, B, C, D, E, F, G, and H, having each a fighting efficiency of A, 80; B, 75; C, 70; D, 65; E, 60, leaving F, G, and H, at, let us say 20 each. By navy regulations, "A" becomes his flagship, and his squadron would probably be formed:—"A" in lead; "B" in rear; "C" following "A"; "D" in advance of "B"; and "E" following "C," or in center. Why? Because in this formation both flanks are protected by heavy fighters, and his weak fighters are in the center, helped some by both heavy flanks, and their combined strength being helped out by "E." His squadron or fleet goes into battle in this formation:—



The value of his fighting ends are thus:—

"A" = 80	and	"B" = 75	and his center: —
"C" = 70		"D" = 65	
"A" + "C" = 150		"B" + "D" = 140	"F" + "G" + "E" + "H" = 120.

His second in command would be "B," 75, the second best fighting ship. His second in command and himself have had such intimate intercourse that No. 2 knows how No. 1 intends to conduct the battle. If suddenly owing to a forced turn No. 2 is put in front, the whole fleet is not thrown in confusion, No. 1 knows that No. 2 will follow his (No. 1's) well-studied plan of battle. If either flank is heavily assailed, his best ships are there to meet the attack, and if the weak center is hard pressed, the weak vessels are held together by "E"'s fighting capabilities; and, moreover, both flanks can lend a little assistance. This admiral then becomes at once as a skillful chess player. Why? Because he knows the value of his units. Suppose another admiral does not know the value of his units, and his fleet and flagship went into battle in this order, so arranged because of his lack of knowledge:—

"F", 20. "G", 20. "A", 80. "B", 75. "C", 70. "D", 65. "E", 60. "H", 20.

In such an arrangement, if No. 1's end is attacked he would quickly lose "F" and "G," if he could transfer to "A" he would be in an admirable position to continue the fight, as in reality he has (carrying out the chess illustration) only lost pawns in value; but his confidence in himself is gone; and, more to the point, his confidence in his ships (individual units). "A"'s fighting value, coming into play so quickly, may regain his own confidence, nay more, may win the fight; but, who can say how near the fight was lost to him; and, how can he account to his government for the loss of "F" and "G," when the other admiral lost no ship? Clearly only by the statement:—"I did not know the fighting value of my units."

In this manner, I have endeavored to show how important it is to an admiral to know the fighting value of his units. For he must know this in order to arrange "any order of battle" intelligently. In all future naval battles, until some wonders are accomplished in "means of communication" during battle smoke, battle noise, battle excitement, battle confusion worse con-

founded; the simple order "Follow my movements" (or proceed as my pre-arranged plan of battle calls for, this latter calling for almost divine powers of foresight can be excluded) must be the order. From this it follows only the very simplest:—"Right (or left) turn; right (or left) half or three-fourths turn; column right (or left); ships right about," are about the only moves possible on the ocean's chess board.

The admiral that attempts more invites defeat. He may fight at half distance, or three-fourths distance, or distance. In all these simultaneous movements, the "line of bearing" remains the same. In other movements the "line of bearing" changes, but it takes time to accomplish a complete column right (or left); and a knuckle is always made where the weak ships, as they reach this point, are liable to meet disaster. Hence the "moored target" for individual ships miniature, or real, battle practice.

If an enemy be slower than your fleet, he is bound to turn or bend his "line of bearing" away from yours to prevent being capped or T'd, in which case you have him steaming on the arc of an interior circle to you and your fire converged upon him, while his fire must diverge upon you, and, fighting efficiency and strength being equal, speed alone being in your favor, the end is inevitable;—you will win mathematically, at least.

So much for a few very general fleet tactics; there is nothing new in them, and, yet through practice at them, and them alone, battles will be won. Just as a very important after-thought, let it be stated that the closer you can fight your ships the more concentrated your fire, and the more each ship will lend her aid to her (perhaps weaker in battle efficiency) sister; and again, any student of naval affairs can see how closely Admiral Togo followed just such tactics; in fact, used no others.

FLEET BATTLE PRACTICES.

The magnitude of this subject, I must confess, nearly frightens me, but I may say I have felt the same with each subject so far advanced. So, in apology, I can only say what I here offer is merely a suggestion, worthless it may be, but "good may come from it." So I will follow my system, and good may come, and will be sure that the result will be an improvement over the desultory results obtained by following any "will-o'-the wisp" ideas, without any system.

1. As laid down in the above the admiral of the fleet places his new arrival, that is the fresh (six months commissioned) ship, in her proper place in the line of battle. He knows, approximately, her "fighting efficiency."

2. Not having done so before, it is suggested that fleet calibration be now indulged in. It seems that the system now in vogue requires ship calibration. Then why not fleet calibration? If the critics now say I am dealing with absurdities, I answer, No! I am following my system consistently, and in this I am also following "Gunnery Instructions, 1905" (our little abridged Bible). If it be asked, "Of what possible use can fleet calibration be"? I answer; if by fleet calibration, an admiral can know that with a given index of powder, and the flagship's Barr and Stroud giving 6000 yards distance from enemy, and his next in line be calibrated on the flagship; and, if in three trials, with 12-inch, the flagship can bring shots on the target, and then each ship in the line being calibrated on the flagship, and on each other; it follows, the flagship may signal her sight-bar range and bearing of target for last shot, then clearly the flagship obtains the sight-bar range for all the fleet, and also clearly each ship bringing target on this bearing, she could, if calibration had been logically carried out, open fire. In other words, the flagship has settled for all other ships the sight-bar range. Think what this means. I do not assert here that fleet calibration is a possibility, but if it be a possibility, the admiral should know it and use it. Months, if necessary, should be spent on this, and maneuvering the fleet in simple battle maneuvers systematically would yield a harvest of results. This period could also be used for perfecting "fleet communication."

3. This step is devoted to maneuvering in the presence of an assimilated enemy; a fleet of cruisers, representing an enemy, under a second in command is seen. The battleships approach in battle order. By a series of time signals (sound, sight or wireless); signals to concentrate on any ships of cruiser squadron; the admiral could test "fleet fire-control," and by using Barr and Stroud instruments, in connection with time signals, on each battleship and using fleet calibration tables, and tabulating these results, sight-bar ranges, as signalled from flagship could afterwards be checked by the fleet ordnance officer; and sight setters drilled as in battle. This tabulation should also include deflections used.

Nobody can deny that by these maneuvers, we are working on a system, looking to fleet battle proficiency, and working on a logical, reasonable system.

4. A series of floats, rendered non-sinkable by water-tight subdivisions filled with water-excluding corn-stalk cellulose, should now be used for mounting and displaying targets, to be towed by a powerful tug or tugs with a tow-line sufficiently long to keep tugs out of danger and by a simple use of sub-caliber an assimilated fleet miniature battle practice, or practices could be adopted.

6. After this has been drilled at for some time, the country could well afford an expenditure of ammunition, and total destruction, if possible, of the entire system of floats at anchor.

Not only every available naval officer, but every available Congressman should be invited to witness this. A solemn oath of secrecy being obtained from each and every witness on results obtained. The naval officers for experience and observations, and the Congressmen to induce liberal appropriations. This would show an absence of desire to conceal results, and appropriations could be intelligently made, especially for ammunition.

The writer does not look for a speedy realization of this system in its entirety, but simply lays down a plan, or system of procedure, that, in his opinion, is logical, and reasonable, and then asserts, without fear of being gainsaid, that any fleet that carried out this or any other similar plan for battle preparations would be able to defeat any fleet of equal size or strength in the world, in precisely the same manner, that the trained football players of "Princeton," or "Yale," or "Harvard" could whip or defeat scrubs.

SEVENTH. IN CONCLUSION, A COMPARISON OF PRESENT RESULTS, WITH RESULTS OBTAINABLE IF THESE OR SIMILAR SUGGESTIONS ARE FOLLOWED, WITH A COMPARISON IN COST.

The results obtained by the present desultory methods are:—

(1) A very few trained pointers at record practice ranges.

(2) An increasing knowledge and experience on the part of a very few up to ranges of 4500 yards.

(3) No unmeasured range and firing of over 4500 yards.

(4) A few night practices at short known range, and a little experimenting with day and night tracers.

The writer is quite sure that no naval officer will say that our efforts have been crowned with unqualified success, considering that in accomplishing the above we have used up five years of peace in battle preparations.

On the other hand, it is only fair to say, that it took untold energy and perseverance to wake the navy up, and inculcate a spirit of enthusiasm for target practices. The navy as a whole has been roused, and the Ordnance Department has been roused to putting forth its best efforts in improvement of "gun-mounts," "gun-sights," etc., so that few could recognize the new gun, or mounts, or sights. It is firmly believed that our mounts, sights, and gearing leave little to be improved upon. These held back the navy, so in all fairness, one should say that even the old lack of system has produced wonderful results. But it seems as if now the effort that accomplished this was more or less spasmodic and the "*Laissez-faire*" period is about to seize the navy again. I am sure that if, it, this period, does take hold, it may thank a too meagre appropriation for ammunition, the navy is always willing to do its share, but it needs encouragement from other sources; sources outside itself. I think I have been fair to the results of the last five years.

The results obtainable if this, or any other similar, suggestion be adopted:

(1) Ships will be ready for battle practice, or captains will lose their commands; and, I think it will be found, that as a rule, the ship will make her percentage of hits on battle practice.

(2) The navy as a whole will have received and digested valuable knowledge and experience, and each ship will find it easier and easier to arrive at battle proficiency in the allotted time.

(3) Even during the greatest part of the (also suggested) shortened cruise, or commissioning of a ship, quite three-fourths of it in fact, a ship could take her place in the "line of battle," and render a reasonable account of herself.

(4) The writer's confidence that the following of any reasonable system will be attended by decreased desertions, also a spirit of content, in the wake of this an increase of re-enlistments, or a much bigger return for the time spent in training.

These four are only a few of the benefits that, the writer here expresses his confidence, would accrue to the navy and to the

government, by the dropping of casual methods and adopting some system.

Again as to cost, if the writer's suggestions be followed, especially in regard to enlarged sub-caliber practice, let 3-inch be mounted on the muzzle of turret guns, and 3-pounders in or on 6-inch, and the cost will only be increased by the cost of ship's battle and fleet battle practices and, as shown, results will pay and give large returns for this increased outlay. Nothing in this paper changes any methods or practices now in order except advanced practices, and by a liberal and intelligent use of sub-caliber, we do away with the necessity for them; for, by one bound, we are ahead of the advanced practices, as now held; possibly the admiral may desire a little latitude to carry out advanced fleet-target practices, in which event, if the department approves of his plan, he should be allowed every help. Moreover, as laid down in the paper, no attention has been given to torpedo practice. This should be confined to its legitimate sphere "torpedo boats," "destroyers," and "submarines." The torpedo was designed as an answer to the ram. It has answered to the ram, nor is it believed that any admiral would fire away this weapon and lay himself open to being rammed. On the other hand, the Japanese used torpedoes as designed.

(1) For night raids.

(2) To keep an enemy vigilant, and in the end by never ceasing vigilance to break him down physically as at Port Arthur; or to give the "*coup de grace*" as in the Battle of the Sea of Japan. In other words, the torpedo is not an offensive weapon, the guns are a ship's offensive weapons, and her biggest guns are her heaviest weapons of offense.

EIGHTH. A FINAL SUMMING UP, OR SUMMARY OF THIS PAPER.

Beyond bringing out the system that pervades this paper, showing that it is consistent throughout and making a little more emphatic the points, upon whose importance, the writer wishes to lay particular stress, there is nothing to add to the subject if it is intended to keep within the limits of an article.

1. For a period of 25 years we have experimented with station bills, and the end of the quarter-century finds the navy with no standard organization. It was better in the old days when the

department did have printed standard organization bills giving each man his station at "all hands," "fire," "collision," "loosing sail," "furling sail," etc., etc. So in 25 years we are worse than when we started, as we have no standard organization bills as before.

2. The department has endeavored to follow a uniform method for providing crew and officers for ships, but owing to the scarcity of officers and men they have found themselves unable always to follow any plan. The writer knows of a case where seeing a ship under repairs at a navy yard, the assistant secretary said, "What is the matter with that ship"? "A few repairs and a general overhauling are necessary." "How soon can they be made"? "Oh! if necessity arose, she could be made ready in four months' time." "Very well," and on his return to Washington, orders were issued to commission said ship on November 2! The Bureau of Navigation saw no means of providing either officers or crew; but the ship was commissioned with a commanding officer, executive officer, one junior lieutenant, two ensigns, and a crew of 150 men; none of these with over a year remaining of his enlistment. When such things can happen, of course, no system can be followed, but such causes may account for this part of the lack of system. It leads to heart-breaking experiences to officers and men and produces a very large number of desertions and every thing that follows in the wake of desertions. A rigid system would be better than this, and moreover, as shown, a ship could accomplish real results in her "shaking-down" cruise.

3. No ship freshly commissioned has any business in the "make-up" of a fleet; as shown, it is not a fighting unit until that ship has had a battle practice, in fact, in war times, it would be a constant source of worry to any admiral. Phantom ships would be better, for they cannot be sunk or lost.

4. The business of a fleet of battleships is to reach the acme of fighting proficiency in reasonable time and this can be done, only by giving the admiral command of fighting units of known fighting value and then letting him put them through their paces.

5. Sub-caliber practice is more important than ever, and the weight of sub-calibers should be increased. It seems feasible, to the writer, to put a heavy sleeve over the chase of a 12-inch rifle, which sleeve, if turned out, to fit the chase of a 12-inch rifle, could carry trunnions and saddle of a 3-inch, and a lighter sleeve with

two set screws could bring muzzle of 3-inch in adjustment, so that bore sighting of the 12-inch and bore sighting of 3-inch, would bring axis of bores parallel, and make 12-inch sights usable on 3-inch sub-caliber. Of course, 6000 yards elevation for 12-inch would not mean 6000 yards for 3-inch, but something less; but a table could be provided from the proving grounds showing 3000 yards range on 12-inch elevation would be 2500 yards, let us say, for 3-inch range, etc. If 3-pounder cannot be fired in axis of bore of 6-inch, they can be mounted on chase of 6-inch or 7-inch in the same way. This method gives to these sub-calibers, which are really very high-powered guns for their weight, the use of their own recoil cylinders, and does away with strains on the guns proper. Moreover, these larger guns are not rigidly held; their own recoil cylinders coming into play, more or less, and relieving the strain on chase of gun. The objection that the gun's balance would be changed could be easily remedied by adding suitable weights to breach of guns and loading would not interfere seriously with the use of proper sights. I have gone into details at length with this matter, because sub-caliber practice with such guns would really amount to something, and the appropriations could easily stand such sub-caliber practice, in fact, many of them. The cost of firing the guns themselves is practically prohibitive; and results of meagre expenditure of ammunition would not justify its use, moreover, with the larger sub-calibers, much could be learned, that would otherwise cause an excessive expenditure of ammunition in the guns themselves. Unless I have read the signs awry, this is the best use to which guns of this caliber can be put.

6. I have applied the same system to the fleet that I have used with the ship, and very logically. I refer, of course, to calibration, and sight-bar range finding, "fire-control," etc., as applied to the ship. They bear the same relation to the internal organization of a ship, that they do between the units of a fleet; only one is internal and the other is external. One is a unit itself, the other, the relation of that unit to its sisters in the fleet.

While agreeing with the essayist of the prize essay of 1905, that the logical position of the admiral is not on the firing line, and realizing the value of his suggestions concerning a fast non-sinkable cruiser with lofty observation stations for the admiral, the

writer thinks too much value has been ascribed to a purely defensive weapon, the torpedo, in that article, at least in its present state; nor does he agree with the use of small caliber guns for piercing the tops of turrets—that chance may be given its true value, *i. e.*, zero—and late English writers hold that nothing under the 6-inch can be relied upon to stop the torpedo boat, therefore he has neglected to use in his battle practice any smaller calibers that the main and intermediate batteries with which our present battleships are equipped. He does heartily agree with him in the use to which he puts the battle fleet, and cruiser squadrons; and, for the purpose of this paper sees no reason why an admiral of a battle fleet should want to increase the size and probable appearance or balance of his fleet by having added to it, an imperfectly drilled ship of unknown fighting value. Such a ship would be put to better purpose, if it could be left to its own resources until it has assigned itself a known fighting value, this paper sets a time limit to that, unhampered by fleet regulations and drills. The cruiser may be excepted from this, as they may rightly be required to do police duty, or legitimate cruiser duty elsewhere. So the paper, strictly speaking, applies only to the battleships; and, strictly speaking, battleships and possibly armored cruisers, need more preparation for battle than cruisers and would always be our main reliance in battle. The aim of the paper is to call attention to the palpable fact, after 5 years of the battle fleet's existence as such, that the drills they have been put to have only developed a very limited result. Ships have been paraded up and down the coast, and put through dangerous and impracticable maneuvers that never would and never could be used in battle, unless the admiral wished to invite defeat. No attempt has been made to battle signals, or battle communication. Seamanship, in its modern sense, has won battles in the past, and will in the future. Borrowing terms from the prize essayist of 1905. Admiralship or seamanship applied to admirals will win battles in the future, not with the admiral leading in his own person, but by applying the broad principles underlying the art of war to the fleet in the time of peace. This is admiralship in its highest sense, and as practice makes perfect, it had better be applied and applied at once to our battle fleet. The writer insists that any system is better than no system. In other words that we have lacked system in our endeavors and occasional, spasmodic, casual methods will

no longer do. He realizes that the department has been hampered and harassed, and that even attempts at systems similar in many respects to the suggestions of this paper have been made, only to be upset by unforseen circumstances. Admirals have attempted to carry out a system, and these attempts, too, have been, and are being defeated daily and hourly by outside influences. They have evidently been working at cross purposes. If the department and the admirals would work together on some well-defined, carefully studied out, system, more would assuredly be accomplished.

It will be seen that this essay suggests:

For individual ships:

1. Uniformity of organization.
2. Permanency of organization.
3. Uniformity in formation of crews.
4. Permanency in target ranges.
5. Extended use of sub-caliber.

For the fleet:

6. Fleet drills simplified.
7. Fleet battle target practice.
8. Fleet calibration.
9. Fleet communication.

A.B.G.B.S.

By "Black Joke."

(Reprinted from the *United Service Magazine.*)

The cryptic letters which head this article come to us from across the Atlantic. They stand for "the all-big-gun battleship," which is the short title whereby it is permissible to cite "the all-big-gun one-caliber battleship of high speed, large displacement and gun-power." We, however, being the proud possessors of the thing, the *Dreadnought,* have the less need to employ several lines of description whenever we wish to refer to the idea. The Americans, like other foreign powers, have not yet translated the idea into concrete fact; but official opinion seems to be strongly in favor of losing no time in doing so. It is proposed here to try to estimate the value of the expressions of that opinion which have been made public in this country. This will perhaps be done most readily by examining in some detail the paper by Lieut.-Commander Sims, which is published in the current number of the Proceedings of the United States Naval Institute, and by calling attention to the manner in which President Roosevelt has adopted and endorsed the conclusions of that paper.

It will be remembered that in June last an article descriptive of the battle of Tsushima was contributed to the Proceedings by Lieut. White, U. S. N., who drew his information from a Russian officer who had been present at the battle. This observer had no official duties to attend to, and was specially told off to make notes of what he could see. Lieut. White naturally was much impressed by the information he received from this Russian, and he succeeded in imparting his enthusiasm to Lieut.-Commander Sims, inspector of target practice, who at once requested that Lieut. White should be appointed to his department. This was

done; and Lieut.-Commander Sims, drawing at will on the second-hand Russian information, proceeded to compile a long paper setting forth his views of the lessons to be drawn from the battle. The paper, when completed, was submitted to the President, who has endorsed its conclusions, and has sent it on to Congress with a covering letter, in which he strongly urges that the battleships to be built should be of the type described.

At first sight it might appear to be difficult to criticise conclusions arrived at in such a manner and so strongly recommended. The difficulty, however, is more apparent than real, for a reasonable amount of consideration will show that Lieut.-Commander Sims's arguments are flimsy to a degree. The most remarkable factor in the case is that President Roosevelt should have allowed himself to be persuaded by them, and it is first of all necessary to try to explain how this can have happened. Probably no one will deny that to go at all thoroughly into such a controversy as that which has raged, and is raging, round the *Dreadnought* type, would demand a great amount of time and attention. With regard to the battle of Tsushima alone, it would be necessary to study and collate the considerable number of reports which have come from observers on either side, and it would also be very desirable to weigh the opinions formed on those reports by authors of repute. The mere bulk of this is serious. Of matter printed in English and French alone the names of six volumes and of nearly twenty long articles occur to me at once, and no doubt there are some of importance which have escaped my notice. At least a half of this great bulk is direct evidence, the rest is first-rate comment. How, it may well be asked, is a busy man to give a proper share of attention to all this? Obviously it is impossible. The most that he can do, if he is forced to come to a decision, is to call for a report from a subordinate, to examine that report, to glance at the evidence on which it is based, and then to act. This probably is a fair statement of what the President has done in the instance now under consideration. He has had before him the article by Lieut.-Commander Sims, the short paper by Lieut. White on which it was based, and Captain Mahan's earlier essay to which Lieut.-Commander Sims refers. He may also have called for some official criticism of Lieut.-Commander Sims's paper, though of that his published letter gives no trace. The fact would seem to be that the burden of the inquiry has been laid

upon the inspector of target practice; and, if the truth has not been attained, the blame for the failure must rest upon him rather than upon the President, who by the multitude and importance of his duties is precluded from historical research.

It is interesting to notice what the evidence is that Lieut.-Commander Sims has used. Lieut. White's observer was a Russian constructor, not a naval officer; and in the preparation of the paper under consideration his evidence was not checked or supplemented in any way. Every officer will realize at once that from one single account, especially from the account of an untrained observer, it is frankly impossible to arrive at more than a vague approximation to the truth. It is possible, therefore, to estimate the value of this paper by a consideration of evidence which might have been weighed, but was not; and it is not unimportant to bear in mind that in any case some of the most valuable of the existing evidence was necessarily a sealed book to the author. He could not have been expected to do so well as an English naval officer might have done, but he might easily have done very much better than he did.

If, then, the account of the battle is inaccurate, as it necessarily is, what can be said in favor of the deductions drawn from it? They, too, cannot but be faulty, and that not only because Lieut.-Commander Sims has shown himself to be unequal to the task of weighing evidence, but also because he himself by his training and service is not qualified to judge truly of the lessons of the battle. To the cobbler there is nothing like leather; to the gunnery expert there is nothing like guns. But although guns are a most important factor in naval war, it can hardly be urged that the study of ballistics and of target practice is likely to fit a man without further study for the tactical or strategical handling of a fleet. In his paper Lieut.-Commander Sims does indeed dogmatize about tactics; but he scarcely even mentions the word strategy. Seemingly it did not even occur to him that the demands of strategy have to be considered in the designing of ships. The design, then, of the A.B.G.B.S. which he advocates is based upon the opinion of the gunnery expert and the observation of a constructor. Are such officers, even if working in combination, competent to say what a ship should be? There are many who consider that the *matériel* side was too strongly represented upon our own *Dreadnought* committee, but at least that committee was

not composed exclusively of Sir Percy Scott and Sir Philip Watts. And even had it been, it would have been far stronger and more competent than a combination of the inspector of target practice and a foreign constructor of unspecified, but comparatively junior, rank.

It has seemed to me necessary to examine into the authority of this paper at some length before proceeding to criticise its details, because there is, and has for long been, a growing tendency to accept the word of any man who can truthfully be described as an "expert" without pausing to consider whether he is speaking of his own subject or not. Where Lieut.-Commander Sims speaks of the methods of modern gunnery he merits close attention; but when he conducts a historical, or perhaps it would be better to say a judicial, inquiry in defiance of all rule, or when he proceeds to design battleships in oblivion of the fact that such a science as strategy exists, and in a grotesque ignorance of the elements of tactics, it is imperative to recognize the fact that the cobbler has forsaken his last and is no longer a trustworthy guide. This criticism is undoubtedly severe, but by quoting chapter and verse I hope to justify it.

Lieut.-Commander Sims begins his paper by announcing that the conclusions reached by Captain Mahan, as a result of his survey of the Battle of Tsushima, "are, I believe, opposed to those reached by practically all naval officers who have given this subject serious consideration." A modest claim! The event may be held to prove what the term "serious consideration" means to Lieut.-Commander Sims, and how radically his conception of it differs from that held by those students of the battle in this country—by no means few in number—who agree in the main with Captain Mahan. It will be assumed that readers of this article are familiar with Captain Mahan's views; and it will also be assumed that the general remarks already offered as to the nature of the evidence on which Lieut.-Commander Sims relies will prove sufficient introduction to an examination of specific statements. For the sake of clearness, passages from the paper under review are printed in italics. The comment which follows them is mine.

The plan of the battle was drawn to scale from the very full data (bearings, distances, and speeds) supplied by the Russian observer.

As to this, note that the plan of the battle differs in many essentials from every other plan which has been made, though some of the other observers were decidedly more competent than this Russian constructor; that to take exact bearings during a battle is absurdly impossible, owing to the utter derangement of compasses; that the Russian range-finders were avowedly so inaccurate as to be all but, if not quite, useless; that the estimate of the speeds differs entirely from that formed by Togo, to name one authority only. This reference to the impossibility of taking true compass bearings, etc., will make it clear that a final decision as to the exact courses the fleets were on at any given time is not likely to be reached. Lieut.-Commander Sims seems satisfied that during the first phase of the battle the fleets ran on parallel lines to the N.N.E. Togo said that he steered east, and shouldered the enemy off to starboard; and in this Captain Semenoff corroborates him. The weight of evidence on this, as on other similar points, is against Lieut.-Commander Sims's observer. The point would be of minor importance were it not that on this unwarrantable assumption a claim to have refuted Captain Mahan is based.

If the Russians had been able by superior speed to run in to 1800 yards (the battle range of their choice), they would have made a large percentage of hits.

Why "the battle range of their choice"? The Russians had a great preponderance of heavy guns. They opened fire at long range, before Togo fired a shot, thus showing that they expected to gain by so doing; and they did in fact do most of the damage they inflicted by this distant fire. Of this there is sure evidence, though Lieut.-Commander Sims did not know it. Also Captain Semenoff shows that the question of closing the range did not arise till the Russian ships had been so severely battered that their "range-finders and gun-directing positions" were wrecked,[1] and their fire had become wild; and he gives no hint of their wishing to close to 1800 yards. On this point the Russian constructor is unsupported, if, indeed, he said such a thing; the evidence inclines strongly against him.

The Russian admiral approached the Tsushima Straits with two objects: (1) *to elude the Japanese and take shelter in Vladivostok;*

[1] "Battle of Tsushima," p. 81.

(2) if forced to fight,, to do so at the shortest range possible. He was defeated in both these objects solely by the superior speed of the Japanese.

The first object is granted. The second, as we have seen, is not proven. The ensuing claim simply shows that Lieut.-Commander Sims either has not read, or is incapable of understanding, what Captain Mahan has written. In that essay it is proved in the most logical and convincing manner—mathematically, in fact—that superior speed had nothing whatever to do with Togo's power of bringing Rogestvensky to action. The question is one of strategy pure and simple, and there is no man living who could shake Captain Mahan's authority on such a point. As to (2), the claim is wild. "Barfleur" has shown[2] and it has been repeated in simple terms in these pages,[3] that the faster fleet can only prevent the slower fleet from closing by turning away. We know that Togo did not turn away; we know, in fact, by Captain Semenoff's[4] evidence, that the Russians led down towards the Japanese line till they were forced to turn away again by the hotness of the fire directed upon them. Therefore, we may safely conclude that, whatever tactical gain he may have drawn in other respects from his speed, Togo drew no demonstrable benefit from it in the direction cited.

Their superior speed (which was 6 to 7 knots greater than that of the Russians) enabled the Japanese repeatedly to concentrate upon his (i. e., Rogestvensky's*) leading ships.*

Six to seven knots is a big order. Just before the battle Togo's cruisers steamed for a considerable time, alongside the Russian line, and reported its speed as 12 knots. Togo accepted this as being true, and we must also accept it. If, therefore, the Russians fought at 9 knots, as the constructor and Captain Semenoff agree in saying that they did, it becomes clear that battle speed is necessarily very much below the extreme fleet speed. This, in a general way, we have long known to be the case. Considering, then, that on the Japanese side the nominal N.D. speed of the slowest ship, the *Fuji*, launched nine years before, was 16.5 knots, we may be quite sure that the Japanese fleet speed in action was

[2] *United Service Magazine*, Jan., 1907, p. 363.
[3] "Naval Policy," pp. 238, 263.
[4] Page 82.

nothing like 16 knots, as postulated by the Russian constructor. The best English opinion, based on evidence vastly superior to any to which Lieut.-Commander Sims can have access, is that it was not more than 14.5 knots. It may be noticed, however, that if it be allowed—in spite of the evidence—that Lieut.-Commander Sims's claim will hold, his argument, as far as speed is concerned, is in favor, not of the *Dreadnought* type, but of the *Invincible*, which will have a superiority of from 6 to 7 knots over normal battleships. As to the claim that the Japanese were enabled by their speed to concentrate on the leading Russian ships, it has been proved, as clearly as any proposition can be proved, that the initial concentration was due to Rogestvensky's bad order, and to Togo's turning at the proper moment; and that the later concentrations, when they took place, were due to the Russian attempt to close the range after they had lost their range-finders. Also Lieut.-Commander Sims seems to forget that it is not necessary to forereach on a fleet in order to concentrate on its leading ship. The drawing-board proves that it suffices to be ranged abreast of it.

The sole tactical ability of the slow fleet is a negative one. The fast fleet always can (1) *refuse or accept battle;* (2) *choose his own range;* (3) *control the rate of change of range;* (4) *control the compass bearing, thus taking advantage of the weather conditions.*

"Always" has been proved over and over again to be a great exaggeration. The fast fleet can sometimes do some of these things to a quite insignificant degree. It is not necessary for me to heat up the old arguments again; they will be found in "Naval Policy," and in my former articles, and they have never been answered. They cannot be waved aside by mere assertion. It is fair to mention, however, that, as Lieut.-Commander Sims wrote in the summer of last year, he cannot have had these arguments before him in the form in which they are familiar to me; but it is very unlikely that they were not advanced in some form when his paper was being debated in his own country. I would repeat, however, that if the A.B.G.B.S. was not given "superior speed," she would have superior armament, so that the big fast ship meeting the big slow ship would be likely to find that the range most suited to her capacity was out of gun-fire. As to (4) I would urge that no case has been made out. In theory, the fast fleet has

the choice. In practice, there is much experiment necessary before we can tell how the choice should be made. Before Tsushima it was assumed that the commander of the fast fleet would prefer the weather berth and the sun at his back. Togo chose neither; but whether he would have done so had the strategic conditions allowed him a free choice, we have no means of knowing. This much is certain, that the Japanese shot well against wind and sun, so that it seems clear that the point is of relatively slight importance. As to the sun, the introduction of telescopic sights has much reduced the difficulty. As to wind, we simply do not know whether it is best to have the weather or the lee gauge. Probably head to wind, in which position all smoke and mirage from hot gases would be swept astern at once, would be best; but if this is so, it is clear that neither fleet can have an advantage. If the wind is abeam, or on the quarter, it is possible that the advantage is with the fleet to leeward. Captain Semenoff speaks of the impossibility of seeing through the pall of smoke to leeward, or through the mirage of heated air. The ships to leeward would not suffer from this disadvantage.

A fleet that is slightly faster can (1) *bring the slow one to action;* (2) *can choose his own range, etc., etc.*

Please observe the "slightly." The only instance given is Tsushima, and a difference of speed of 6 or 7 knots has been assumed. There was, in fact, probably a difference of 5 knots, which is neither "slight," nor—for future purposes—"practical politics."

It follows that the slow fleet must always fight at a disadvantage even in the open sea; and that when restricted in its movements by the neighborhood of land, or by the necessity of leaving port in the face of a blockading enemy, it must inevitably be defeated by a faster fleet of equal power.

Very little of the "serious consideration" which Lieut.-Commander Sims began by demanding is necessary to show that there is no *sequitur* about this. There is a queer assumption that the neighborhood of land must always be to the advantage of the fast fleet: it is often repeated, and has not yet, as far as I have noticed, been questioned. Perhaps no one has as yet given it "serious consideration." But a very strong case against the assumption could easily be made out. To take an instance near home. Suppose a fast enemy wishing to pass the Straits of Dover, and sup-

pose a slower fleet to be in the Straits to prevent him. As the fleets came in contact they would, of course, go off towards one coast or the other. The faster fleet would be on the outer circle, and its object would be to work round the flank of the slow fleet. This it would not succeed in doing. If the range were 6000 yards (advocates of superior speed usually postulate long range), the radius of the inner circle would be 18 miles, and of the outer 21 miles for ships of the *Lord Nelson* and *Dreadnought* classes at full speed. That is, the radius alone is greater than the width of the straits. Therefore, the fast fleet could not pass; or, in other words, the advantage due to the land would lie entirely with the slow fleet. Take 3000 yards as a minimum range, and suppose that the fast fleet chose to engage at that. Then the radius of the outer circle would be 10½ miles, and still the fast fleet could not pass. The fact seems to me to be obvious that, unless the slow fleet deliberately—or by gross carelessness—allows itself to be caught between the enemy and the land, the advantage always falls to its share, for the simple reason that the fleet on the bigger circle will be the first to come into contact with the land.

As to "the necessity of leaving port in the face of a blockading enemy," it is only fair to Lieut.-Commander Sims to suppose that his recollections of Santiago have obscured his judgment and made him forget Port Arthur. He has quite forgotten that in modern warfare mines and torpedo-craft of all kinds make close blockade, especially by night, an impossibility; he would even seem to forget how Togo blockaded Port Arthur; indeed, his imagination seems to picture some such attack as Graves might have made, but did not, off the Chesapeake in 1781. That sort of thing is dead. If a fleet wishes to come out, it will do so easily enough, fast or slow. And it will always have the choice of coming out at night and gaining an offing before daylight allows of its being brought to action.

Captain Mahan lays great stress upon the alleged effect of loss of funnels. . . . This appears to me to be a great exaggeration. It has been reported that the British ship Edgar lost two of her funnels without any material diminution in her speed.

Lieut.-Commander Sims does not refer to the results of the late war in detail. He does not even refer to the fact that though the Russian fleet was steaming at Tsushima at only 9 knots or so, those ships which had their funnels shot away could not keep up.

The *Tsarevitch* and other earlier instances have been mentioned often already. Let us notice now the case of the *Suvorov* at Tsushima. She lost both funnels; her engines were not damaged; she was not short of coal; her engine-room complement was untouched; we know that before the fleets came in contact she was steaming at 12 knots. Yet as soon as her funnels were gone she became helpless, and could only crawl. What is still more important is that the smoke, after the loss of the funnels, not only cleared the bridge and made the deck uninhabitable, but also shrouded the ship in a dense pall, and eventually suffocated practically the whole ship's company. Captain Semenoff gives a graphic description of the state of affairs. The ventilators carried smoke instead of air below, with the result that when the admiral left the ship there remained of a crew of 900 men only about 50 living, and those were the men who were in the open and on the weather side. It would appear that Captain Mahan and others did not exaggerate the effect of loss of funnels; they did not even grasp how serious it might be. As for the *Edgar*, some six or seven years ago she lost a funnel in the Bay, and came home to Devonport with one. That she was not seriously inconvenienced by the loss was due to the fact that she was steaming at slow speed, and could do without the boilers which belonged to the missing funnel.

The main thesis of this article, however, is that the A.B.G.B.S. results from the claims of gunnery officers, based on improved methods of fire-control. This section is not easily criticised, for the information on which it is based is omitted, as being confidential. For present purposes it must consequently be presumed that the gunnery officers can show how to use a broadside of all 12-inch guns effectively, and criticism must be confined to pointing out the errors and fallacies in the belittlement of the secondary battery by which Lieut.-Commander Sims seeks to support his case. As a preliminary, it may be remarked that the Japanese did pretty well at Tsushima, although they are believed to have had little of what we would now understand by the term "fire-control"; and that arguments for the one-caliber ship based on spotting are quite invalid. Spotting is all very well when one ship is firing; in a fleet action, when half a dozen or more are firing at the same target, it loses its value.

Then comes the important question of the secondary battery. Lieut.-Commander Sims argues entirely from the alleged inferiority of the 6-inch gun. His argument runs roughly thus: (1) The trajectory of the 6-inch is not flat. At 6000 yards the horizontal danger-space for a target 30 feet high is, for a 12-inch gun 120 yards, and for a 6-inch gun 64 yards. (2) With one caliber only of heavy gun, fire-control is much simplified. (3) At battle ranges the 6-inch gun cannot perforate, therefore cannot harm. (4) At Tsushima the 12-inch gun made 19.6 per cent of hits, and the 6-inch only 2.1 per cent. If these data are accepted, the inevitable conclusion is that the 6-inch gun is out of court. But there is small need to accept them unquestioned; the arguments by which they are supported are quite inconclusive, and may be answered somewhat as follows.

(1) This is true enough. But as the business of the 12-inch gun is with the ship, and of the 6-inch with her upper works, masts, funnels, etc., it follows that the target for the 6-inch gun is much greater than for the 12-inch. It is also known that the 6-inch gun, partly in virtue of its handiness, is accurate at 6000 yards, out of all proportion to its lack of flatness of trajectory. Obviously exact figures cannot be quoted, but this much may be said, that Lieut.-Commander Sims's experience of the 6-inch gun does not apply to that mounted in the royal navy. (2) Some of the difficulties of this have been already touched upon. There is a great deal to be said on this point in favor of the 6-inch gun. Interference is not a bran-new discovery; there are weather conditions when it may be slight. If the fast ship can choose her weather conditions, she will pick them accordingly.

(3) The 6-inch gun does not want to perforate; it can defeat the enemy ship without. Captain Semenoff distinctly says that the demand for perforation is a mistake, and that the Russian ships were destroyed by the mass of bursting shell which did not perforate. (4) The figures are utterly untrustworthy. Japanese reports make the results quite different; so too does Captain Semenoff, who says that the number of Japanese shells striking the *Suvorov* was too great to be counted, that he could not imagine such a fire. If all the Japanese heavy guns were firing on the ship at one time, though it is very doubtful if they ever did so, and if they made the 19.6 per cent of hits claimed for them, even so the 12-inch hits would be only 3 per minute, a number

which an old hand might be relied upon to count. The fact is, that we know from our own gunnery returns that the hitting power of the 6-inch gun at 6000 yards or so is not one-tenth of that of the 12-inch, but many times as great. We know also, on certain evidence, that the Russian fire was tolerably accurate at first, but that, as soon as the Japanese found the range, it became wild. The one established fact is that a ship whose decks are covered with a hail of bursting shell, cannot hit the target. The bearing of this is very important, but cannot be argued at length in the space at disposal.

Another point to mention is that Lieut.-Commander Sims notices no other secondary gun besides the 6-inch. He seems to have forgotten that we have long since adopted the 9.2-inch. Now the 9.2-inch in range and in flatness of trajectory compares extremely favorably with the 12-inch. It can be relied on to do good work at any range at which the 12-inch is effective, and its hitting power in our service is three times that of the 12-inch. This very important consideration has been entirely neglected. Even on the supposition that a case could be made out conclusively against the 6-inch, no such case would stand as against the 9.2 inch. The 9.2-inch can put a greater weight of metal into a target at battle ranges in a given time than any other gun.

It is also to be noticed that Lieut.-Commander Sims, in comparing his big ship with the potential little ship, makes the latter a 16-knot ship of about 13,000 tons, mounting four 12-inch guns and some 6-inch. The 6-inch he rules out of court, and calls her a four-gun ship against his eight-gun big ship. It is rather a primitive method of argument, for no nation is thinking of building 13,000-ton ships, or of adopting so low a speed as 16 knots. The small ship of the present day, for practical purposes, may be considered to be of 14,000 or 15,000 tons, with a speed of 18 or 18.5 knots. Such a ship would, of course, carry four 12-inch guns, but she would also carry a secondary armament of 9.2's. The Austrians have perfected a design to carry four 12-inch and eight 9.2's, with a speed of 20 knots, on a displacement of 14,000 tons. On something like the same displacement, if we sacrificed 1½ or 2 knots of speed, we could build a ship to meet our sea-going needs and to carry the same armament. It is, therefore, clear at once that all Lieut.-Commander Sims's theorising about a short line of big ships each having a broadside of eight 12-inch, opposed

to a line of twice as many ships each having only four 12-inch, is mere words and worthless. The small ships would not be twice as many as the big ships. They would be probably half as many again, say 12 as against 8. And the effective broadsides of the two fleets would be, for the long fleet, sixty-four 12-inch guns; and for the short fleet, forty-eight 12-inch, plus forty-eight 9.2's. That is half as many guns again, and not, as Lieut.-Commander Sims would tell us, an equal number.

I have left myself no space to examine Lieut.-Commander Sims's conception of fleet tactics, and frankly there is no need to do so in detail, for he shows himself to be quite ignorant of the first principles of the art. The first requisite in dealing with such a subject is to be exact, and to take care that your diagrams are drawn to scale. The author has not paid heed to this matter; and in each of the three diagrams which he gives to prove the superiority of the short fleet, he makes the enormous cardinal error of placing the fleets from 1200 yards to a little less than a mile apart. From this unsatisfactory beginning he argues that the short fleet if ranged abreast of the long fleet's van, would be out of range of its rear, or rather, that the angle would be so small that the sternmost ships could not bring their guns to bear. A diagram drawn showing the fleets of which he speaks in the position described, shows that, when the range is 6000 yards, the sternmost of the short fleet is only 25 degrees before the beam of the sternmost of the slow, or long, fleet. That is, the ships of the long fleet could all develop their full broadsides without the slightest inconvenience.

This same error, and others equally gross, are present in all that the author says of tactics. He assumes, for instance, that the slow ships will maneuver at 400 yards', or two cables, distance, and the fast ships at 450 yards apart. Why? The slow ships are 400 feet long, the fast ships 500 feet. The proportionate minimum distance for the fast ships would be 500 yards; but, since long ships are less handy than short, very high authorities in this country hold that the long, or fast, ships will have to be placed at three cables, 600 yards, apart. What with these tactical errors, combined with the utterly unjustifiable assumptions about the nature of the armament which the slow ships would carry, it follows that the conclusions reached are not only suspicious, but worthless.

It does not seem to be necessary to refer at length to the letter in which President Roosevelt recommends Lieut.-Commander Sims's conclusions. The letter repeats one or two of the arguments used, sometimes in a more exaggerated, and therefore less defensible, form. There is, for instance, nothing to recommend so fantastic an illustration as that of two 10-gun ships engaging ten 2-gun ships. The advantage would not be with the two, as is suggested, for the ten, by the use of the helm, would bring all their guns to bear; then each of the two, being concentrated upon, would fire wildly, while two only of the ten would be under fire, and the remaining eight would be shooting as uninterruptedly and as well as at target practice.

Interesting suggestions occur as to the tactical advantages which a more numerous fleet might draw from its very numbers, but these must be held over. They are not indicated by anything which Lieut.-Commander Sims has said, though possibly his failure to perceive anything of the kind has helped to suggest them.

NEW LIGHT UPON THE CAREER OF JOHN PAUL JONES.

[Introductory Note.—Mr. James Fenimore Cooper, of Albany, N. Y., has kindly allowed the Institute to print the following letter, not hitherto published, which was written to his grandfather, the author, James Fenimore Cooper, by Janette Taylor, a niece of John Paul Jones. The gallant sailor was a past master with the pen as well as the sword, and his niece, judging from this sample of her correspondence, inherited many of his characteristics. Much interesting information about John Paul Jones has been unearthed during recent years, and, this letter throws new light upon certain matters about which there has been dispute. It is of particular value as corroborating the story that John Paul assumed the name Jones out of respect for Willie Jones of North Carolina, and as fixing his place of burial in the old Protestant cemetery where General Horace Porter successfully sought for his remains. While Janette Taylor, with reference to things within her own knowledge, may be relied upon, allowance must be made for her evidently strong prejudices, as, for example, when she accepts it as a fact without question that Mr. Morris sold her uncle's sword to Richard Dale. The truth about this latter matter, curiously enough, is disclosed by Mr. Charles Henry Hart in this same number of the Proceedings.]

96 Morton Street, New York, 28th Octr. 1843.

Sir,—

I have recently perused your sketch of the Life of Commodore John Paul Jones, my uncle, published in Graham's Magazine, and find it substantially though not precisely correct—its errors are of minor importance, it is true, but still they are errors—and as I am informed the sketch will be introduced in another work, I think it right to correct them, to the end that you may avail yourself of the same, if you think fit.

You say, "and sailed for *Whitehaven*" . . . "in the John of *that port.*" He *did not* sail for Whitehaven, but for *Kirkandbright*, a small seaport in Scotland, about 30 miles from the place where Paul Jones was born, which previous to the American Revolution, enjoyed considerable trade and where the owners of the John, Curry, Beck and Co. then resided. Here on a beautiful peninsula, at the mouth of the Dee, stands St. Mary's Isle, the seat of Lord Selkirk.

" It is probable he left the service of the house which had given him his first command in consequence of a prosecution that was instituted against him for causing the death of the carpenter of his brig, a man named Mungo Maxwell ".

Now no prosecution on account of Maxwell was ever instituted against him, *anywhere*. Mungo Maxwell was connected with a family of that name then considerable landed proprietors in Galloway, who threatened a prosecution, and John Paul, for 6 months, held himself in readiness to answer any charge that might be brought against him, but *none* was ever *instituted*, and the the affidavit of Capt. James Estment, sworn at the Mansion House London, on the 30th Jany. 1773, before James Townsend Lord Mayor, and that of the Judge of the Court of Vice Admiralty of Tobago, set the affair of Maxwell completely at rest. The *original* affidavits are both in my hands. He left the employ of the house which had given him his first command because *that house had no longer any employment for him*, as is manifest by the following certificate, which has been published, and of which the original is in my possession.—" These do certify to whom it may concern, that the bearer, Captain John Paul, was two voyages master of a vessel called the John, in our employ in the West India trade, during which time he proved himself every way qualified both as a navigator and supercargo; but as our present firm is dissolved, the vessel was sold, and of course he is out of our employ, all accounts between him and the owners being amicably adjusted.

" Certified at Kirkandbright this first of April, 1771.

" CURRIE, BECK & CO."

James Simpson, the Judge Surrogate of the Court of Vice Admiralty of the Island of Tobago, says in his Affidavit 30th June 1772 that he particularly examined the shoulders of Mungo Maxwell " which had thereon the markes of several stripes, but none that were either *mortal* or *dangerous* " he does not even say the punishment had been *severe*, but that he had dismissed the complaint as frivolous.—Although both affidavits are inserted in Sands's compilation it is obvious he had never read them, otherwise he would hardly have committed the egregious blunder of making a man after he was dead prosecute another for murdering him—any one would have pitied Mr. Sands had they beheld him when I showed him this blunder, which is but one among many—

the page had been stereotyped, and Mr. Converse who cared not if the book contained as many errors as words, so he only made money by it, would not be at the expense of a new plate.

When John Paul had been discharged from the employ of Currie, Beck and Company, on the 1st April, 1771, he remained in Scotland until towards the end of that year, awaiting the threatened prosecution.—Although circumstances conspired to prevent his ever returning to his native land, he *did not abandon it* or leave it with a view of never returning—he proceeded to London to take command of the ship Betsey of that port in the West India trade.—With this ship he made two or three voyages and left her in the West Indies in the *end of the year 1773*, when he proceeded to Virginia for the purpose of arranging the affairs of his brother who had died childless and intestate, and no heir, at the time, being in America the Commonwealth had administered on his estate.—Paul Jones ultimately recovered two thousand pounds or about ten thousand dollars from the wreck of his brother's fortune, a paltry sum, it is true, but this, with his funds in Tobago which afterwards had been also recovered, he was moderate enough to consider an independence,—to the first he refers in his letter to Lady Selkirk, when he says "nor am I in pursuit of riches. My fortune is liberal enough having no wife nor family" &c. and in his letter to the King of France, in which he disclaims the character of an adventurer in search of fortune, "of which, thank God, I have a sufficiency", and again in a letter to the Marine Board, at the time he was superseded in the command of the Alfred, "I stept forth as a free citizen of the world in defense of the violated rights of mankind and not in search of riches whereof I thank God, I *inherit* a sufficiency".—These assertions, with his saying that the United States had ordered a copy of his Medal to be presented to every sovereign, and every Academy in Europe, Great Britain excepted, are Mr. Mackenzie's grounds for charging him with lying, his charge with regard to the medal, however, on the authority of Mr. Jefferson's letter, he has been obliged to retract.—Nor has Mr. Sands, in the text given him credit for truth when speaking of his *inheritance*, I showed Mr. S.—his mistake, but according to custom the page had been stereotyped, and could not be altered. Mr. Sands made a kind of bungling explanation in a note appended to another page.—From the letter of Paul Jones to Stuart Maury, Esq^{r}. of Tobago, which

I annex, it appears, that, on his leaving that island, he had left behind him considerable property, for he had been engaged for a year or two, as a merchant as well as the commander of a vessel.—

If he had not had private funds where was the money to come from that he advanced for the public service from the very first?—if he was "a *needy adventurer*" he at least had had it in his power to afford *pecuniary aid to no* **small amount**, to the still more **needy** country he served—he had been seven years an officer in the navy before he received a single cent of pay, that is, from the 7th December 1775 to the 9th December 1782, when he was paid, as the commander of a squadron, somewhat less than is now allowed a passed midshipman on duty—as for rations he *never got any* either for himself or his servants—at one time he was upwards of twenty thousand dollars in advance, exclusive of his pay, some part of which of several years standing—and he never received any interest for any of his advances.

The brother of Paul Jones, spoken of, had gone abroad at an early period of life, and settled first in the island of New Providence, and afterwards in Fredericksburg in Virginia, where he realized a considerable fortune, and was well known to many respectable gentlemen of Virginia, among others to Mr. Maury so long American Consul in Liverpool.—

The affair of Maxwell could have nothing whatever to do with Paul Jones's leaving the West Indies for America, because Estment's affidavit on the 30th January 1773 put that matter to rest, and he did not leave Tobago till the end of that year.—neither is there any room to think it had any connexion with his adding the name of Jones to his family name, which he did not do until he entered the American Navy, *two years afterwards*.—There are strong grounds for believing that he adopted the name of Jones either in compliance with the wish of, or as a mark of his gratitude to, General William Jones of North Carolina, who had been one of his earliest friends, and that this circumstance is known in General Jones' family, but be this as it may, had concealment been his object he would doubtless have dropped the name by which he had been previously known, altogether.

"While at Philadelphia Jones received his commission as Captain, signed by John Hancock; it was dated August the 8th. This fact rests on *his own assertion*."

It *did not* rest on his own assertion, for I had the commission—it was torn but the names and date and all that was essential were entire, I gave it to a gentleman because it contained the autograph of John Hancock, and I know not whether it is, or is not recoverable.

Much has been said of the vaunting of Paul Jones. One biographer says something on the subject, and another repeats it with a treble echo—it ought to be remembered, however, that his boasting was generally called forth by peculiar circumstances. A man has every right to bring forward his services, when those who should remember seem disposed to forget them. Besides what may be concentrated in a small memoir was in reality diffused over the correspondence of twenty years of active life. Any one who reads what Nelson, Rodney, Drake and other renowned men say of themselves, will find that in boasting Paul Jones does not stand alone. And these men only *fought* for their country for which they were *honored* and *rewarded*.

You put a low estimate on Noblemen's plate when you say "Some plate valued at about £100, was delivered"—perhaps this is a typographical error, the printer having omitted a cipher.—The redemption of it, however, cost Paul Jones upwards of a thousand pounds sterling, exclusive of his own share as captain and his paying the expenses of its conveyance to London, of which I have the bill. In his letter to the Countess of Selkirk, of Novr. the 8th, 1784, he tells her that being disappointed in an opportunity of sending the plate by sea from L'Orient to London "I applied to Government for leave to transport it through the kingdom by land, and the Duke of Dorset (British Ambassador) has been so obliging as to write to the Custom-house at Dover requesting them to let it pass to London without being opened. It is now arrived here (Paris) and will be forwarded immediately to your sister (Lady Morton) in London, under the lead that has been affixed to the case that contains it, by the Farmers General at L'Orient, and the seal of the Duke of Dorset that has been affixed to it here. The charges to London are paid and I have directed it to be delivered at the house of your sister"—M. de Cullons in a letter of the 24th Sept. 1784, to Paul Jones says, "M. the Count de Vergennes has delivered to me the letter which you had written to him, to ask his permission to transport by land from L'Orient to Calais the plate of Lady Selkirk, which you

had permitted to be taken by your people during the last war, and which you afterward purchased to return to her ladyship.

"That action, Sir, is worthy of the reputation which you acquired by your conduct, and proves that true valour perfectly agrees with humanity and generosity.

"It gives me pleasure to concur in the execution of this honorable proceeding.

"I have therefore, given orders to the Farmers General to permit the transportation of the plate from L'Orient to Calais, free of duty, and you may write to your correspondent at L'Orient to deliver it to the director of the Posts, who will take upon himself the care of having it transported to Calais, and to fulfil all the necessary formalities."—It is not probable so much, and even far more trouble would have been taken about articles only worth a hundred pounds.—The oaken chest in which the plate was carried away and returned is still to be seen at St. Mary's Isle.

"His name has been connected with that of a certain Delia, supposed to be Madame T—— and also with that of a lady of the name of Lavendahl." Delia was not Madame T—— at the time I published in Britain I did not myself, know who Delia was. She was a Countess in her own right, and connected by one side of the house with British nobility—Madame T—— was the daughter of Louis the 15th and I have proof that she was acknowledged by Louis the 16th as such—The Countess of Lavendahl was an accomplished woman of fashion, her portrait of Paul Jones is a fine painting, and said to be a good likeness. It is in the hands of his relations, with the verses she wrote under it.

I have a multitude of letters from persons of fashion of both sexes, among others from the present King of France's mother, which I have not thought necessary to communicate to the public, and have not decided on whether I shall ever do so.—I should not have noticed those mentioned above had they not previously been mentioned by Sherburne in his abortion and in a Memoir published in London.

After saying that he sailed from New York on the 10th Novr. you proceed: "Jones landed in England, at some risk, as he thought, of being massacred.—He went from Plymouth to London and thence to Paris, making the whole journey in five days; tolerable proof that he did not relish the country though dispatches were the professed object of so much haste. had he been

known, it is by no means probable that he would have escaped without injury."—

Now there exists not the shadow of evidence, that I can discover, of his having *expressed* or *entertained* either *then* or *previously* any dread of injury from the British people.—In the beginning of his account of the Campaign of the Liman he says "The United States of America having charged me with a mission of a political nature to the Court of Denmark, and having at the same time furnished me with a letter to deliver personally to his most christian Majesty Louis 16th, I embarked at New York on the 11th Novr. 1787, in an American vessel bound for Holland, the captain of which agreed to land me in France.

"After a voyage of a month I landed at Dover in England, not being able to get ashore in France. From Dover I went to London where I saw the minister of the United States (Mr. Adams). I passed some days with my friends there, and went to *Covent Garden Theatre.* I afterwards set out for Paris, where I arrived on the 20th December." The London prints of that day spoke of his appearance on the American Walk in the Royal Exchange,—and I have myself met with a gentleman who told me he had seen him there.—Mr. Mackenzie states that he never visited England but on urgent business "and then he remained unknown in the vast solitude of the capital."—The Theatre and the Exchange were rather singular places to select for seclusion.—

About two years and a half subsequent to the period last spoken of, viz. in May 1790 he went to London to arrange some pecuniary matters with Dr. Bancroft; on the 27th Decr. 1790 he wrote from Paris to Madame Le Mair d'Attigny (I quote from the draft of the original letter rather than from the translation) "Ayant en une affaire d'interest à arranger en Angleterre, je me suis rendu d'Amsterdam à Londres, au commencement du mois de Mai pour la terminer. *Je manquois d'etre assassine en debarquant.*"—The foregoing short sentence is the sole ground out of which so much has been tortured concerning his apprehension of personal injury from the British.—It is the *first* and the *only time* such a thing has been spoken of, or even hinted at, in the whole course of his voluminous correspondence.—That Great Britain may have contained some solitary individual whose mistaken loyalty led him to believe he was doing his country good service by ridding the world of a rebel, is not improbable, but Paul Jones

had *no cause to apprehend,* and there exists no evidence, that I know of, that he *did apprehend* any injury from the people at large.—

There seems to be a confusion of dates in what follows—You say "In *1789* Jones determined to go to Denmark" . . . . "He had actually got as far as Brussels when he was unexpectedly called to America, where he arrived in Spring and left it for the last time the 11th Novr. *1787.*" That is to say he returned to America in 1789 and left it again in *1787.*

No one can more sincerely regret than myself, that my uncle had not *decidedly rejected,* if not *indignantly spurned* Denmark's offered pension.—Mr. Mackenzie says "it is not easy to see how the pension could have been withheld."—It was withheld simply because *it was never asked for by Paul Jones himself,* and refused to his heirs on the ground that he had declined accepting of it.—Paul Jones lived sixteen months after Mr. Short and Mr. Morris had given it as their opinion that he might with propriety accept the advantage offered by Denmark, yet he never drew for the same, and in all probability never would.—Mr. Morris who drew up the schedule of his property a few minutes before his death, made the arrearages of the pension an item therein, probably thinking the heirs might as well take them if they could get them.—I have refused to join in any application for the same.—

"In 1790 Jones was in Paris" . . . . "He manifested more interest in his Scotish relations this season than he had lately done, and speaks of the education of his nephews and nieces".—

This proceeds from your want of information.—It was my intention at first, to publish the whole of my uncle's letters to my mother, by which it would have appeared that his interest in his relations was uniform and ardent from first to last, but as they contained reference to matters of a domestic nature which it might have wounded the feelings of some connected with me to see in print, and not wishing to have the letters garbled, on reflection, I deemed it best to withdraw them altogether, after they had been put into the hands of the publisher. This I now regret but I could not then anticipate that I was thereby leaving open a door for bringing in a charge against my uncle.—Mr. Mackenzie has accused him of never expressing any wish to see his relations, which he seems to think sprung from his great reluctance to visit "the immediate country of his birth, and the home at once of his

youth and of his early manhood, *whose coasts he had selected as the favorite scenes of his ravages.*" The last sentence might have sounded well enough in the mouth of a Briton, but comes with an ill grace from the pen of an American.—nor can his native land be styled, with propriety, either the home of his youth or early manhood. He left his father's house at the age of twelve years, and his after visits were short and far between, in fact from that time till after the Revolutionary war he never resided, on land, for two consecutive years in any part of the world America excepted, his home was on the deep. But that *he did* contemplate and without "*reluctance*" a visit to the place of his birth there exists proof. In his letter from Paris of the 26th March 1787 to Mrs. Taylor (my mother) he tells her "I have a great desire to see you, and will exert myself for that purpose after I have finished my public business." he ends the letter by saying "Make my affectionate compliments to Mrs. Lowden and do not write till you hear from or *see me.*" The public business spoken of was the recovery of the prize-money in France. When that terminated he had to proceed to Denmark on a similar mission, and before that matter had been adjusted he entered the Russian service.—On his return from Russia to France he made preparations for his long projected visit which was defeated by ill health.—Three months before his death he wrote Mrs. Taylor "A succession of circumstances have prevented me from leaving Paris, and I have not had to boast of my health for a considerable time past, but my health is improving, and as what is retarded is not always lost, I anticipate the pleasure of seing you in course of the summer. I have had some conversation here with one of the professors of the College of Glasgow (believed to be Professor Millar) and could easily induce him to direct the studies of your son at that University, should we deem it advantageous to send him there. Your daughter interests me much. My desire is that her education be continued without interruption. I shall explain myself more particularly on this head hereafter. Adieu my Dear Mrs. Taylor. Assure Mr. Taylor of my kind regards, and inform me of whatever may be interesting to yourself or your relations." From this time till his death his health became daily worse and worse.

In one of his early letters he thus expresses himself—"A friend in London has promised to send me a particular account of the

advantage resulting from placing a boy at St. Paul's school London, and transferring him from thence to the University of Cambridge or Oxford.—I am glad your daughter understands music, which is a most advantagious accomplishment to a young woman who has a good ear and voice. I need not mention Italian music has now the opinion of all good judges in its favor.—Everything that regards the economy of a family should be comprehended in female education, and a woman should be able, and have tast sufficient to make up with her own hands almost everything she wears, particularly in articles of Millinery. Reading and writing correctly and Arithmetic are essential talents. The best reading is History, and to read this with advantage it is necessary to understand Geography and to read with the Map. Reading romances only serves to fill young heads with ridiculous visions, and has a direct tendency to corrupt the morals. Dancing is a necessary talent for youth and Drawing is a genteel and sometimes a useful accomplishment." It appears that the friend in London was Dr. Edward Bancroft, who informed P. Jones that he was obliged to withdraw his own son from St. Paul's school, on account of the corruption of his morals,—who replied that he had adopted another arrangement with regard to his nephew.—In another letter he sends my brother the Latin inscription on the blade of the gold hilted sword, presented to him by the King of France, for an english translation, and adds "as an encouragement for him always to excell all other scholars of his class, I will begin by promising to send him a Gold Watch, by Mr. Kennedy, or the first good conveyance I can find, after you shall inform me that he is worthy of wearing it."—In no position can the character of Paul Jones be placed where it will more advantageously be seen, than in his intercourse with his relations—with them he had nó interests to pursue, and his attachment was pure and disinterested even from childhood.

"He was interred at Pere la Chaise July 20th."

Pere la Chaise, if I mistake not, was not opened as a public cimetiere 'till *1812,* at any rate, that and other public burial grounds, in Paris, were not open when Paul Jones died.—He was interred in the old Protestant burial ground, purchased by Lord Viscount Stormont (afterwards Earl of Mansfield) when British Ambassador at the Court of France—it was situated near the Barrière du Combat, and is now, I believe, totally covered with buildings.—

His relations realized about *Forty thousand* dollars of his estate, exclusive of his claim on Russia for arrearages of pay and all his prize money. His claim on Denmark, for the three ships delivered to the British, and the arrearages of the pension. His claim on the U. S. Government for arrearages of pay and interest on moneys advanced by him for the public service during the Revolutionary War.—His lands in the State of Vermont, which the person who had charge of, allowed to be sold for payment of Taxes.—

13,000 acres of land in a small Territory near the Laurel Mountains called the Indiana Company's purchase, which were taken up by the United States, & for which they refuse compensation.

His Bank stock received by Mr. Robt. Morris, in his solitary act of Executorship, for which my aunt's husband, Mr. Lowden, very foolishly accepted his Notes at *one* and *two years' date,* at a time Mr. M. was known to be on the eve of bankruptcy.—*The Notes have never been redeemed.*—

The property from which the sum spoken of was realized, was Loan Office Certificates, in the hands of Mr. Ross of Philadelphia, for Two thousand dollars, at par, with great arrearages of Interest, being for ten or twelve years.—Recovered by my brother.

Money in the hands of Mr. Ross, and effects left in his care, which were sold.—

Lands in the State of Ohio, for which five thousand dollars were paid before the foot of civilized man was in the State—which were sold.—

One thousand eight hundred pounds Sterling—in the hands of Sir Robt. Herries, London.

Money in the possession of Paul Jones at the time of his death, and from the sale of his effects in Paris.—

Personal property in Holland, brought to Britain and sold.—

From the partial payment of his claim of 60,000 livres on the French Government, and debts due by private individuals.—

The whole of the claim had been allowed by the French Government, but the turbulence of the times and her own domestic affairs obliged my Mother, who inherited all the energy and spirit of her brother, to leave Paris with her sister's husband, after remaining there seven months during the bloodiest scenes of the Revolution.—

Between Forty thousand dollars, and forty thousand pounds

sterling there exists some difference, though a man possessed of even forty thousand dollars cannot be called an absolute beggar —but my uncle was too generous a man to be rich, notwithstanding he must have known that poverty is in this country considered a sin worse than witchcraft.

Your speaking of Sands's Compilation induces me to give you some account of the circumstances under which it was produced.

Immediately previous to my arrival in this country (1st January 1830) I had a Memoir of my uncle printed, but *not published* in Britain.—My publishers knowing that I could not, as an alien, hold a copyright in the United States, proposed retarding the British publication until a fortnight after my arrival in America, in order to afford me time for making some arrangement with a publisher here for a reprint, so that the publications might appear simultaneously in both countries. For this purpose I applied to Carry & Co. Philadelphia, leaving the work in their hands for examination. By some awkward mistake the work was not returned me 'till the time I had been allowed had nearly expired. Mr. Carry's accompanying letter informed me that he would reprint the book, but that he could not afford me any compensation, giving in excuse a long account of the state of literature in the United States, which it would be of no use for me to repeat. On talking the matter over with Col. Stone he said, " We must have a copyright work for this country and not a reprint," and for that purpose proposed to me Mr. Sherman Converse, who he said was a very enterprizing man, as publisher, and Mr. Sands, a young gentleman in his office, he said, would undertake the editorship. shortly afterwards I was introduced to Mr. Converse, who offered me a thousand dollars for the use of my British work, the Mss from which it had been compiled and other Mss not published in it.—Mr. Sands was to be allowed 250 dollars for his trouble, which *I* understood, and which Mr. Sands told me *he* understood was to be paid by Mr. Converse, he has often told me that he would never allow his compensation to be taken off the paltry pittance allowed me, for Converse would make a fortune by the book.

My object being to rescue my Uncle's character from the odium unjustly thrown upon it and not pecuniary advantage for myself, I accepted Mr. Converse's offer, stipulating that the proof sheets should be sent me for examination and correction.—Our bargain

was a verbal one, made in Mr. Converse's house, without any witness *on my part*, his wife or some of his family may have been in the room.—At this time I had been little more than a fortnight in America, knew nothing about either Mr. Converse or Mr. Sands, and was completely ignorant in regard to the law of copyright here, I then believed that it was necessary that the *Author, Editor* or *Compiler* of a work, as well as the *proprietor* should be an American citizen in order to secure a copyright, had I been as well informed then as I am now, I would not have thanked anyone for his services, much less paid for them.) I could have done what was necessary myself and have taken out the copyright in the name of my nephew, who was a citizen by birth.

Mr. Converse informed me that the work would be published by subscription, and that it was requisite it should appear to be for *my benefit*. I objected to this for two reasons, first, because it was not the truth and second because in England publication by subscription is considered a very mean proceeding, but Mr. Converse said my name was necessary to protect the work, for no respectable bookseller would publish the British work in opposition to my interest, whereas they would have no such delicacy with regard to him.—I thought there might be something in this and allowed him to represent the thing his own way—but as subscriptions had been asked for in my name I wished to know to whom I was obliged and requested a sight of the subscription list which I never could obtain; he even kept up a letter from a bookseller in Portsmouth, New Hampshire addressed to myself.—10,000 copies had been subscribed for, before the book was printed—it seems Mr. Converse had contracted with some of his distant subscribers to supply them with 5,000 copies on a specified day, and on that day they must be forthcoming, whether well written or ill written it mattered not—his 2 dollars per copy were equally sure, and the public, *as he told me*, would never discern the errors unless I pointed them out.—a truly handsome compliment to the intelligence of his countrymen.

Mr. Sands was both a man of talents and an elegant scholar and *could* and I have no doubt *would* have made an excellent work had he been allowed time, but during the day he was employed in Colonel Stone's office,— it was only odd hours he could devote to biography, and Mr. Converse hurried him so much that he blundered on without examining the documents in his hands, and

without that previous reading which was absolutely necessary for his information.—The first thirteen pages were so blundered they were expunged entirely, you may perceive the work commences at the fourteenth page. The proofs were not sent me. I seldom saw a page until it had been stereotyped, when correction was out of the question, stereotyping and compilation commenced simultaneously,—in consequence I became so much provoked that I threatened to appeal to the public, on which Mr. Sands tried to intimidate me by writing me that I was not aware of the force of ridicule in this country, I told him if I made myself ridiculous by endeavouring to prevent the public from being imposed upon, that, I would abide the consequences.—They then inserted in the preface that "Miss Taylor is only responsible for the authenticity of the correspondence quoted from or inserted, and in no wise for the casual observations of the compiler". but perceiving that I was still not satisfied Mr. Sands changed his battery and wrote me a very humble letter *begging* and *beseeching me* to relinquish my purpose of appealing to the public, and if I would do so, that, there was nothing in his power by which he could oblige Miss Taylor that he would not be willing to perform.—I am not to be coerced, but my feelings are very easily worked upon, I pledged him my word that I would remain silent, and told Converse that as I had consented to screen Mr. Sands I could not expose him, otherwise I would have had no mercy on him.—Although his avarice was principally to blame still Mr. Sands, for his own credit, ought to have insisted on being allowed sufficient time to discharge his duty faithfully. He was very much ashamed of his production, as well he might.—

I had considerable difficulty in obtaining the paltry sum promised me, indeed *I did not* obtain it, for Mr. Converse would not pay me unless I allowed the 250 dollars for Mr. Sands to be deducted, and Sands would not deliver up my MSS until he was paid,—Converse, in a note, says, if the work is successful he may refund me the 250 dollars but that he does not bind himself to do so, as much as to say I need never expect it.—I do not know what he calls success, he has already cleared many thousands by that book. But I could have forgiven his defrauding myself had he only done justice to the public, and not imposed on it, at a high price, a work containing more errors than pages.—

In the beginning he mentioned his intention of embellishing the

work by an engraving taken from the Bust, I told him I should be perfectly pleased, provided an artist capable of doing it justice was employed.—I heard no more of a portrait till towards the end, when he wrote me that his subscribers were very urgent for a portrait and that he intended giving the one in Sherburne with some variations; I replied that variations to a piece of music were common enough, but variations to a picture were something new.—I could have given either a miniature, in my possession, or the medal, but was in too bad a humour with him.—I considered all idea of a portrait to be abandoned, but when the book appeared it was accompanied by the likeness of a human being in no respect resembling any portrait of Paul Jones I ever beheld—where Mr. Converse came by it he has not condescended to inform either the public or myself. The fac simile seems to be taken from Sherburne, without "variations."

With the greatest difficulty I obtained 9 copies of the work, Mr. Sands told me he could not get even one—whether he received any afterwards I know not.—Mr. Converse was good enough to say *I sold* mine, I had a right to do so had I chose it, but I never dreamed of such a thing.—I gave

One to James G. King Esqr. of the house of Prim Ward and King, because he had been a very particular friend of my brother's and because his father the Honorable Rufus King belonged to the Revolution.

One to Benjn. Talmadge, who had been a Colonel in the Revolution.—

One to Colonel John Trumbull, because he had been aide de camp to General Washington, and because he is mentioned in the book.—

One to the Honorable Guilian C. Verplanck, who first presented my Memorial to Congress.—

One to Bishop Benjn. T. Onderdonk, because I belong to his church.—

One to Dr. John W. Francis, who has always been a warm friend to myself.—

One to my nephew, the late William Paul Taylor, midshipman U. S. Navy, and

One for him to present to the Hon. Levi Woodbury, then Secretary of the Navy.—

One to Mr. Sparks, who had been made known to me through the medium of Sir David Brewester, before I left Scotland, from whom I received the following letter in acknowledgment.

" BOSTON, Octr. 1st, 1831.

" DEAR MADAM

" I have lately had the pleasure to receive your favor, containing copies of letters from G. Morris to your uncle, and am much obliged to you for this attention. Morris and Jones were acquainted with each other during the American War, and afterwards a good deal of correspondence passed between them in Europe.

" After returning from a long absence, I received the volume, which you were so kind as to send me, and for which I beg you will accept my best thanks. I consider it doubly valuable from the corrections and notes which you have taken the trouble to add. It is extraordinary that so many errors should have escaped the editor, and the more to be regretted as the work is stereotyped. It is, however, a very interesting and valuable work, and the original letters and papers it contains are an important addition to the materials for American history.

" I am, Madam, with great respect and regard, Your friend, and obt servt.

" JARED SPARKS."

TO MISS JANETTE TAYLOR.

Mr. Sands, page 543 of his compilation says " The credentials of his excellency Governeur Morris, as Minister plenipotentiary to the court of France, had been forwarded to him from America, in the latter end of January preceding (Mr. Sands never condescended to inform his readers what year is referred to, of this he seems to make a point) at which time it is to be inferred from a letter of Mr. Jefferson to him, that he was not in Paris. With him therefore Jones could not have had a long intercourse."

According to Mr. Sands's logic, because Mr. Morris was not in Paris in the latter end of January of some year or other, of course it was absolutely impossible Paul Jones could ever have had with him any previous intercourse.—Had Mr. Sands read with any degree of attention the letters of Govr. Morris to Jones he might have been better informed.—It is melancholy to reflect

on what a mass of information, laid before his very nose, has either been perverted or totally neglected.—It appears from a letter of Morris to Jones dated London 9th July 1790, that Jones had informed him of his being in nomination as ambassador to France, before he knew anything of the matter himself. "You tell me that you understand I am in nomination as successor to Mr. Jefferson, but I believe you was misinformed. I have letters from America as late as the beginning of June, and I have no intimation of the sort."—

Captain Mackenzie presented me with a copy of his book accompanied by a polite and even friendly letter, could I have answered it in the way my heart would have dictated it should have been acknowledged immediately, but he cannot be surprized that I cannot receive with cordiality a book stigmatizing my uncle as a liar and a thief, more particularly as I have in my own possession, unquestionable evidence to the contrary. The charge of falsehood, in stating that the U. S. had ordered a copy of his Medal to be presented to every Sovereign and every Academy in Europe Great Britain excepted, is clearly refuted by Mr. Jefferson's letter, and Capt. M.—has expressed his intention of expunging what he has said on that head.—As to his falsehood in regard to his fortune, allowing that he had no private funds, that he entered the Navy a beggar, this only proves him to have been a very generous man, who did more for the country in a pecuniary point of view than any other naval officer it ever possessed, by making, from the very first, large advances for the public service, from his hard and perilous earnings, while he was receiving nothing from the country himself.

But one of Sands's blunders has doubtless contributed to lead Capt. Mackenzie into error.—In page 28, he says "In the beginning of the year 1775, as will appear from one of his letters, his immediate pecuniary resources, from the causes he mentions, had almost entirely failed him, and for the two following years he lived, as he expresses it, "upon fifty pounds."—*This living on fifty pounds* has reference to the *twenty months* immediately subsequent to his arrival in America in the end of *1773*, and not to *two years* subsequent to the *beginning of 1775* as stated by Mr. Sands.—The following is the letter he alludes to, and which I have already mentioned.—

"BOSTON, 4th May, 1777.

"DEAR SIR,

"After an unprofitable suspense of *twenty months* (having subsisted on fifty pounds only (250 dols) during that time), when my hopes of relief were entirely cut off, and there remained no possibility of my receiving wherewithal to subsist upon from my effects in your island, or in England, I at last had recourse to strangers for that aid and comfort which was denied me by those friends whom I had intrusted with my all. The good offices which are rendered to persons in their extreme need, ought to make deep impression on grateful minds; in my case I feel the truth of that sentiment, and am bound by gratitude, as well as honour, to follow the fortunes of my late benefactors.

"I have lately seen Mr. Sicaton (late manager on the estates of Archd. Stuart Esqr.) who informed me that Mr. Ferguson (Jones's agent) had quitted Orange Valley, on being charged with the unjust application of the property of his employers. I have been, and am extremely concerned at this account; I wish to disbelieve it, although it seems too much of a piece with the unfair advantage which, *to all appearance*, he took of me, when he left me in exile for twenty months, a prey to melancholy and want, and withheld my property without writing a word in excuse for his conduct. Thus circumstanced, I have taken the liberty of sending you a letter of attorney by Captain Cleaveland, who undertakes to deliver it himself, as he goes for Tobago via Martinico.—

"You have enclosed a copy of a list of debts acknowledged, which I received from Mr. Ferguson when I saw you last at Orange Valley.

"You have also a list of debts contracted with me, together with Ferguson's receipt. And there remained a considerable property unsold, besides some best Medeira wine which had been shipped for London. By the state of accounts which I sent to England on my arrival on this continent, there was a balance due to me from the ship Betsy of 909 pounds 15 shilling and 3 pence Sterling; and in my account with Robert Young Esqr. 29th January, 1773, there appeared a balance in my favour of £ 281,, 1 s,, 8 d sterling. These sums exceed my drafts and just debts together; so that, if I am fairly dealt with, I ought to receive a considerable remittance from that quarter. You will

please to observe, that there were nine pieces of coarse camlets shipped at Cork, *over and above the quantity expressed in the bill of lading*. It seems the shippers, finding their mistake, applied for the goods; and, as I have been informed from Granada, Mr. Ferguson laid hold of this opportunity to propagate a report that all the goods which I put into his hands were the property of that house in Cork. If this base suggestion hath gained belief, it accounts for all the neglect I have experienced.

"But however my connexions are changed, my principles as an honest man of candour and integrity are the same; therefore, should there not be a sufficiency of my property in England to answer my just debts, I declare that it is my first wish to make up such deficiency from my property in Tobago; and were even that also to fall short, I am ready and willing to make full and ample remittances from hence upon hearing from you the true state of my affairs. As I hope my dear mother is still alive I must inform you that I wish my property in Tobago, or in England, after paying my just debts, to be applied for her support. You own feelings, my dear Sir, make it unnecessary for me to use arguments to prevail with you on this tender point. Any remittance which you may be enabled to make through the hands of my good friend Captain John Plaince of Cork will be faithfully put into her hands; she hath several orphan grand children to provide for. I have made no apology for giving you this trouble: My situation will, I trust, obtain your free pardon.

"I am always, with perfect esteem, dear Sir, your very obliged obed^{t} and most humble servant,

"J. PAUL JONES.

"STUART MAURY, ESQUIRE, Tobago."

I do not *say*, nor I do not *think* that Cap^{t} Mackenzie had any wish to misrepresent a man to whom his country owed so much, I believe his errors to be the offspring of defective information, but better information was within his reach had he taken the trouble to seek after it.—While perusing his work I made some hasty remark and will trouble you with a repetition of some of them.

In the commencement he says, speaking of Mr. Craik of Arbigland who he calls "a bonnet laird *best known to fame* by the fact of our hero being the son of his gardener".

That Capt Mackenzie should be ignorant of the character of Mr. Craik of Arbigland and other eminent men of Great Britain is not wonderful, but he ought not to put down his own conjectures for facts. William Craik of Arbigland was a man still more distinguished by his scientific and literary acquirements than by his splendid fortune and position in society, he was in correspondence with all the eminent men of his day, and was *"known to fame"* before Paul Jones knew existence—It seems to be a fact but little known, in this country, that Dr. James Craik the Physician, legatee, compatriot, and friend of General Washington was an illegitimate son of Mr. Craik of Arbigland, he offended his father by adopting the cause of the colonies, and they never after had any direct communication, but the Doctor kept up, till his death, a correspondence with his half sister, Miss Helen Craik, a lady who inherited the splendid talents of his father, who was a warm friend to myself from my childhood, I may say from my infancy, 'till her death.

I shall not go over what Capt Mackenzie has said regarding the descent on Whitehoven.—Paul Jones had no *mother, sister,* or *relation of any denomination,* at the time, in either Whitehoven or its neighborhood, or even in England. If he can be justified in taking up arms at all on behalf of the revolted colonies he may also be justified for his descent on Whitehoven, if he cannot be the former I ask what apology is to be offered for the signers of the Declaration of Independence, who were *Englishmen, Scotchmen, Irishmen* and *Welchmen* by birth?

Note page 68 Vol. 2d—This sword (the sword presented by Louis XVI to Paul Jones) was sent by Jones's heirs to his valued friend Robt. Morris"—" Mr. Morris gave this sword to the navy of the United States. It was to be retained and worn by the senior officer, and transmitted on his death to his successor".

As a great deal of misrepresentation has been spread abroad regarding the disposal of this sword, I think it right to state the simple facts.—

At the time Paul Jones sent the late Mr. William Taylor, my brother, the latin inscription for a translation, he said it was the inscription on the blade of a sword *that might one day be his,* this nephew is the person alluded to in his Journal of the Campaign of the Liman, when after noticing his having been accused of killing his nephew in the American war, he says " I never had a

nephew, or any other relation, under my command. Happily these facts are known in America. I have *one* dear nephew, who is still too young for service, but who now pursues his studies. Since I came to Rupia I have intended him for the imperial marine. Instead of imbruing my hands in his blood, *he will be cherished as my Son.*"

Had Paul Jones been able to dictate the terms of his own settlement, there is no room for doubt that the sword would have been bequeathed to Mr. Taylor, who was the only son of his eldest and favorite sister and himself one for whom his uncle had always expressed particular regard, and who had never offended him.—Had the mind of Paul Jones been in its wonted vigour it is not at all probable he would have left an article of such value (for independent of the honor conferred, it cost the King of France 500 Louis d'or) and which could not be divided, as the common property of ten co-heirs seven of whom were females.—It seems that it was his intention and wish to divide his fortune equally between his two sisters.—The original will shows this to have been the case, in the first page of which the words "*one-half*" having been drawn through with a pen, but he was persuaded by those around him to divide his property into as many equal portions as there were individuals in the two families, as being more republican, of this fact Colonel Beaupoil and Blackden, two of the witnesses and advisers, have given my Mother a certificate.

He was found dead only half an hour after his settlement had been signed, and his signature is scarcely legible.

The other effects in the possession of Paul Jones at the time of his death were sold in Paris but the sword was carried to Scotland, where, as might have been expected, it became a bone of contention.—The eldest niece of Paul Jones who was married to a Mr. Williamson, wrote to my mother that her husband was going to set off that evening for America, and as he purposed carrying along with him the sword given by the King of France to Paul Jones, if the children (meaning my brother and myself) wished to see it they might come to her house. How the simpleton could imagine that her husband would be allowed to carry off a valuable property of which she owned only a tenth part, I know not, but such was the fact. My mother had Mr. Williamson publicly arrested as he was entering the coach to depart, thereby end-

ing his excursion to America.—The sword was taken to my father's house—after various, and I may add ridiculous, projects for its disposal, that of giving it to Mr. Morris was decided on—my brother and myself were too young to be consulted, our property was given away without our concurrence, and I believe, without that of some of the other heirs who were minors.—Had it been given to the United States or to the Navy, or even to some other public body I would have felt less regret and less ashamed of the folly of those connected with me.—Mr. Morris in his letter acknowledging the receipt of the sword tells the donors, that, in consequence of his being a civilian and not entitled to wear it himself, he had *given* it to an naval officer.—My brother on his arrival in America was informed that Mr. Morris, whose affairs were then in a state of great embarrassment, had not *given* the sword to the Navy, the nation, or to anybody, but had *sold* it to an officer who had been one of my Uncle's greatest enemies.—

A naval officer wrote me on the authority of a Philadelphia paper, that Captain Dale had appeared on the occasion of the launch of the Sloop of War Dale, decorated with the gold hilted sword given by the King of France to Paul Jones, and which the latter had given to Commodore Dale, his father.—How Capt. Dale came to be deckt like the Daw, with borrowed feathers, is for him to say. I cannot believe he would disgrace the name of an officer and a gentleman by asserting a falsehood, but when such an erroneous statement appeared publicly he ought to have contradicted it.—The sword which I presume he purchased can reflect no honor on him, although his mother told me that the whole merit resulting from the capture of the Serapis belonged to her husband, he being the first man who boarded her; I did not think fit to argue the matter, I merely remarked that Commodore Dale in the statement drawn up by himself, or under his authority arrogates to himself no such merit.

Had my nephew survived the sword would have purchased for him, if money could have bought it—and the gentleman, who by the death of my brother and my nephew, has become the male representative of Paul Jones is extremely anxious to have it restored to the family and will give Capt. Dale much more than he paid for it, for that purpose.

Speaking of the Sloop of War Dale calls to my recollection a circumstance connected with the name of my uncle.—It seems that

all the subordinates have got vessels of war, of some kind or other, named after them, while the founder of their navy, the man whose name has been entered in their public records as having "*made the flag of America respectable among the flags of other nations*", has been even worse than overlooked and neglected.—In July 1834 when the Honorable Campbell P. White returned to New York from Washington, where he had been chairman of the Committee on Naval affairs in the House of Repts.—he told me that to gratify me, he had been instrumental in procuring an appropriation for building a first class frigate to be called the *Paul Jones*.—I assured him I was highly gratified, and at various times afterwards made enquiries after the said frigate both here and in Washington without being able to obtain any tidings of her.—In the beginning of 1840 I observed a paragraph in a New York paper saying, that, the keel of a first class frigate, to be called the Paul Jones, which should have been laid at this time at the Wallabout, has been postponed, on account of the scarcity of seamen. The editor adds "Can an appropriation voted for one purpose be applied to another? "We say *No*" but there was a circumstance connected with the affair the editor seems not to have been aware of.—The following is the bill authorizing the building of the Ship Paul Jones. "Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled.

"That the Secretary of the Navy be, and he is hereby, authorized to direct the procurement, in the usual mode, of a live oak frame for a frigate to be called the Paul Jones, and a live oak frame for a sloop of war to be called the Levant; and the sum of 50,000 dollars is hereby appropriated, out of any money in the treasury not otherwise appropriated, for that purpose.

"Approved, June 30th, 1834".

On the last day of this same session another bill was passed—a bill authorizing the President to alter the destination of any *naval* appropriation made that session, which bill was doubtless introduced for the special purpose of applying the appropriation made for the ship, Paul Jones, to some other purpose, what that has been I have never been able to ascertain.—

General Washington, in his letter of the 3d June, 1733, to General Putnam after lamenting that General P. had to complain of the ungrateful returns of his country, says "Ingratitude has

been experienced in all ages, and *Republics in particular have ever been famed for the exercise of that unnatural and sordid vice.*" and verily the United States seem in no wise disposed to prove themselves an exception to the general rule.—

But to return to Captain Mackenzie's book. Page 226, 2d vol.

" It is quite evident that the evil opinion of others did not have the effect of sinking our hero in his own. He was an enthusiast in his own favor ",

There can exist no just cause why the evil opinion of others should sink a man in his own, so long as he is conscious that it is not merited.—To know our own worth, is not to be vain of it, and some people's *censure* is no *slight praise*.

246. " Paul Jones was not particular as to the banner under which he served. The cause was to him of inferior importance to the opportunity of winning glory."

" When he had once brought himself to fight against his own country in defence of freedom and universal philanthropy he could easily have persuaded himself, if necessary, that the cause of the Empress against the Turks was a pious and Christian one. And so with regard to Sweden against Russia."

When Paul Jones drew his sword on behalf of Great Britain's revolted colonies, they had *no navy*, and *no name among the nations*, could neither *pay* nor *protect* him. At a time when Franklin had been denounced in the British Parliament as a "*hoary headed traitor*" and Washington would have been hung and quartered, had he been caught,—Paul Jones had a much brighter prospect of winning the *Gallows*, than of "*winning glory.*"—

Throughout the whole book Mr. Mackenzie speaks as if the North American colonies had not constituted a portion of the British Empire, and consequently, that their sons were even at that period independent.

We cannot choose a country for ourselves, or select that spot of earth on which we are to draw our first breath, but in most instances a control over our personal acts and deeds is put into our own hands.—

General Washington was not only born a British subject, had carried arms in the service of the King of England, but had, moreover, *personally* and *voluntarily* pledged his allegiance to the crown, in as *strong* and *solemn* an *oath* as could be put to man.

Nevertheless, Mr. Mackenzie would be perfectly horrified should any one say that General Washington had "*brought himself to fight against his own country.*"

To his enlightened countrymen, the memory of Paul Jones now needs little vindication for the important act so highly reprobated by Capt. M. After the peace he enjoyed the esteem and private friendship of some of Britain's most exalted sons, of which number were the Duke of Dorset, Admiral Digby and the Earl of Wemyss.—The Duke of Dorset, when British Ambassador in France, received Paul Jones as a visitor in his house.—Admiral Digby, who commanded William IV when a midshipman on the American station during the revolutionary war, was eager to obtain, for himself and for his family, the acquaintance of Paul Jones, and employed a man of fashion in Paris to bring it about.—I have in my possession some original letters of the Earl of Wemys, expressed in very warm terms, in one of which, now lying before me, he says "It will give me great pleasure upon all occasions to show you my great regard and esteem, and that I have the honor to be with a very sincere attachment, Dear Commodore," &c.

By letters of Mr. Henry Vernon, grandson of the British Admiral Lord Vernon, it appears that Mr. V. was one of Paul Jones's most intimate friends.—And these men were all Englishmen.—La Fayette always commences his letters by "Dear Sir" or "My Dear friend" and concludes by subscribing himself "Most affectionately yours, Lafayette."

293. "a want of sympathy between him and his officers and crew, and the total absence of every evidence on their part of affectionate attachment to his person."

What affection was to be expected from a crew composed of the refuse of every nation? Or what sympathy could exist between a commander who was not only defending the cause he had adopted by his personal exertions, but, moreover, upholding it by the use of his private purse, and officers who could never be induced to fight until the vision of a heap of gold was placed before their eyes? he says "I have excited the jealousy of many officers in our young navy because I have pursued honour, while they sought after profit."

Capt. Mackenzie allows that he was not *cruel*, that he very *seldom* made use of the lash,—A commander who has not recourse

to corporal punishment, who exacts no more from his men than it is their bounden duty to the country they serve to perform,—if he does not possess their affection, it will not be drawing a very long inference to say, that, the fault belongs to themselves.—Capt. Mackenzie has since found out, experimentally, that kind treatment will not always attach sailors to the person of their commander.—That Paul Jones was not able to command the affection of his men was not wonderful, but that he was able to command the *action* of such a heterogeneous mass, was—

277. (speaking of P. J. when dictating his will) "He is no longer Admiral or Chevalier"—

He allowed himself to be called Chevalier, but there is no proof that he was particularly fond of the title; to have rejected the honor would have been but a poor compliment to the amiable Prince who conferred it. The visiting cards to the last were inscribed simply "Paul Jones" and in this he, perhaps, betrayed more pride than if he had called himself Admiral or Chevalier, there were many Admirals and Chevaliers, but only *one* Paul Jones.—

Mr. Sparks has, to myself, expressed great regret for some of Capt. Mackenzie's statements, and has disclaimed all connection with the book.

I have written an enormous letter, commenced with the view of correcting some misstatements in your sketch, and continued under the impression, that anything authentic regarding a man whose character and doings you were presenting to the public, would be acceptable to you, if in this I have been mistaken I can only beg your pardon, and entreat your indulgence for any blunder I may have committed, and for the *writing*, I have recently had a severe indisposition and my hand has not recovered its wonted firmness.

I am Sir, Respectfully, Your Most Obed Servant

JANETTE TAYLOR,

Niece, and nearest relation of John Paul Jones, being the only surviving child of Mrs. Janette Taylor, his eldest sister.

TO JAMES FENIMORE COOPER ESQR.

The following is a copy of the original will of Paul Jones, that

published being only a translation of the French version of the Notary Public.

"In the name of God, Amen. I John Paul Jones Citizen of the United States of America, now resident in the City of Paris, being in a very low and weak state of health but of sound mind and understanding, do make this my last will and Testament in manner following, viz:

"I do give and bequeath my whole Estate real and personal unto my two sisters Janette the wife of William Taylor of Dumfries, and Mary wife of Mr. Lowden in the parish of Kirkbean both of Scotland in the Island of Great Britain and unto their Children all to share equally, the whole being to be divided into as many shares as there are persons, and the mothers respectively to take care of the shares of such of her children as are not of age, and to employ the Interest and Profit thereof in their nurture and education, and in case any one should die before attaining the age of twenty-one years, the share of such one to be divided among the remainder, and in like manner if more than one should die.

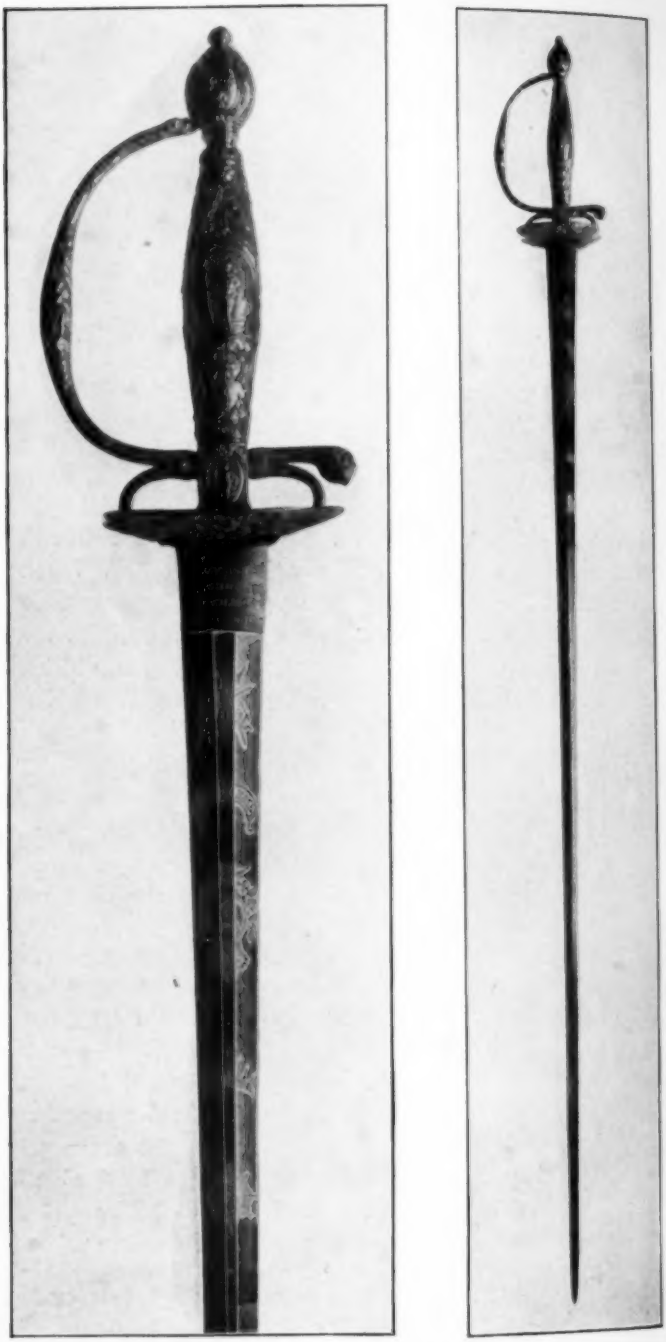
I do make the Honorable Robert Morris Esqr. of Philadelphia my sole Executor. In witness whereof I have subscribed my name and affixed my seal to this which I hereby publish and declare as my last will and Testament.

(signed) JOHN PAUL JONES.

Signed sealed published and declared by the above named Testator who has subscribed the same in our presence and we have subscribed as witnesses in the presence of the said Testator and in the presence of each other, the words *One half of my said*, being run thro' with a pen on the first page and the word *of Philadelphia* interlined on the second page previous to the execution.

JAM^{s} SWAN
signed S. BLACKDEN.
BEAUPOIL

Being ignorant of your address, I enclose the little packet to the Editors of Graham's Magazine, and use the freedom of saying that their forwarding it speedily will oblige *you*—if in this I take an unwarrantable liberty, I very respectfully beg your pardon.



DRESS SWORD PRESENTED BY LOUIS XVI TO JOHN PAUL JONES.

DESCRIPTION OF JOHN PAUL JONES' SWORD.

By CORNELIUS STEVENSON, ESQ.

(NOTE.—To the Numismatic and Antiquarian Society of Philadelphia, we acknowledge our indebtedness for the use of the plate of the Paul Jones sword; to Mr. Richard Dale for his permission to publish it and to Mr. Cornelius Stevenson for the right to reprint from the Proceedings of the Society his description of the sword.)

This historical relic is a fine specimen of designing, chasing, and the swordsmith's craft, and the correct proportions and careful considerations to every detail which it displays are particularly worthy of attention.

The hilt is of gold chased over with figures and floral decorations. The blade is four-sided, tapers to a point, and is 33½ inches in length. It is blued for 11 inches from the hilt, and on one side of the recasso is inscribed the words in gold:

VINDICATOR MARIS
LUDOVICUS XVI
REMUNERATOR
STRENUO VICTOR.

"Louis XVI, rewarder of the valiant, asserter of the freedom of the sea."

On the other side is lightly engraved a motto, which has become obliterated by time. Below the recasso, inlaid in gold, is the sun and three *fleur de lis* surmounted by a crown, and the motto, "Vive le Roy."

One side of the grip is adorned with a medallion of Mars, and on the reverse another of Hercules with a club, and festoons and ribbons held in the mouth of a mythological animal. Below is a standard of flags.

The pommel is made up of two designs: One, three *fleur de lis;* the other, a figure of Neptune with his trident.

The upper surface of the guard plate is ornamented on both sides; on one side a medallion of Minerva, on the other that of Mars, and on the lower surface a similar medallion of Minerva and *fleur de lis.*

The pas d'âne and guard are beautifully chased with floral designs and terminate in dolphins' heads.

THE SWORD PRESENTED BY LOUIS XVI TO JOHN PAUL JONES.[1]

A TRUE HISTORY.

By Charles Henry Hart.

Toward the close of 1779, the whole civilized world was startled by, what was then and has since remained, the most marvellous naval battle on record, the fight between the *Bonhomme-Richard* and the *Serapis*, when the infant navy of the United States won the circlet she has never ceased to wear. The following spring the victor, John Paul Jones, visited Paris, where he was acclaimed the hero and honors were showered upon him, the greatest of which were, as he has himself recorded.[2]

"Honours—by Louis XVI
The Order of Military Merit and a gold Sword. June 28, 1780."

This sword presented by the King of France to Paul Jones, was exhibited at the meeting of this society, held on the 6th of April, 1905, and in the published proceedings of the society for the years 1904, 1905, and 1906, just issued, there appears at page 41, an illustration of the sword, accompanied by a note, which repeats the glaring errors, regarding the inheritance of the sword, that have been repeated so often, as at last to have become, in the minds of many, the true history. The note says:

"By request, Mr. Richard Dale exhibited the sword presented by Louis XVI to John Paul Jones. . . . . which at his death *passed by will*, to his chief officer, Richard Dale, in whose family it has since remained."

[1] Read before the Numismatic and Antiquarian Society of Philadelphia, April 18, 1907.

[2] Sands' Life and Correspondence of John Paul Jones. New York, 1830, p. 548.

Then follows an interesting expert description of the handle and blade, concluding with A. C. Buell's adroit invention, to get around Jones's will, when he found that instrument did not contain a bequest of the sword to Dale, viz:

"Paul Jones while making his will, *orally bequeathed* this sword to Richard Dale, through the hands of Gouverneur Morris, who delivered it to Dale at the first opportunity. Jones's words of bequest were, 'I give this sword to Richard Dale, my good old Dick—because he did more than any other to help me win it.'"[1]

This entire story, like almost everything in Buell's "*History*," is a pure fabrication, cut out of the whole cloth, and a more impudent literary forgery was never committed than this one, which Buell emphasizes, by repeating three times in volume two, on pages 4, 319, and 332.

The truth is Paul Jones died rather suddenly, in Paris, on the 18th of July, 1792, and his will was quickly drawn up by Gouverneur Morris and executed the same day. By it Jones named his trusted friend "the Honorable Robert Morris, Esq., of Philadelphia, my only testamentary executor"; and to Morris, as executor under the will, the title to the sword would legally pass. Morris evidently did not settle up Jones's estate, excepting as to one item, which is the first in "Schedule of the Property of Admiral John Paul Jones, as stated by him to me this 18th day of July, 1792," and signed by Gouverneur Morris, to wit: "Bank stock in the Bank of North America, at Philadelphia, six thousand dollars with sundry dividends."[2] Letters testamentary were not taken out by Morris, for some reason, impossible to tell after this lapse of time, but on the 8th of December, 1794, letters of administration on the estate of Paul Jones, were granted to Morris, at Philadelphia, and a certified copy of the will in French, with a translation into English, was filed with it; and in Robert Morris Ledger. C. fo. 139[3] in his account with the "Heirs of John Paul Jones," the first entry is "1794. Dec. 13. Paid for translation of J. P. Jones Will and for taking out letters of Administration $8.00."

[1] Paul Jones, Founder of the American Navy—A History. By Augustus C. Buell, New York, 1900, Vol. II, p. 4.
[2] Sherburne's Life of Jones. Washington, 1825, p. 351.
[3] Historical Society of Pennsylvania.

A few months after Paul Jones's death, his sister, Jane Taylor,[7] repaired to Paris, from Scotland, and took possession of all of her brother's papers and personal effects, which she carried with her back to Dumfries; and the now famous sword, that had been presented by His Most Christian Majesty, Louis XVI, King of France, to the Scottish-American sailor, "was sent by Jones's heirs to his valued friend, Robert Morris, to whose favor he had owed his opportunities for distinguishing himself."[8] The sword was transmitted to Morris through the hands of Thomas Pinckney, the American Minister to Great Britain, to whom Morris wrote, March 18, 1795, in acknowledgment:[9] "I have in the first place to return you thanks for taking the trouble to forward the sword of the late Admiral Paul Jones, which came safe to hand and I have presented it to Commodore John Barry, the senior officer of the present American navy, who will never disgrace it."

Although not mentioned in this letter to Pinckney, the gift was only for Barry's life, in trust to descend in succession to "the senior officer," as Morris designates Barry in the letter to Pinckney, of the United States Navy for all time,[9] so that to-day the sword of Jones should be in the possession of Admiral George Dewey.

But Barry disregarded this provision and bequeathed the sword, unconditionally, to "my good friend Capt. Richard Dale,"[10] who, two months before the date of Barry's will, had resigned his commission in the navy and therefore should never have received the sword of Jones which has remained in the Dale family ever since.

From this it will be seen that Paul Jones *did not bequeath the sword to Dale,* as the publication of this society says he did, following the untrustworthy Buell, either by testament or orally,

[7] Sometimes called Janet or Jeannette.

[8] Life of Paul Jones. By Alexander Slidell Mackenzie, U. S. N. Boston, 1841. Vol. II, p. 63, n. (See also letter of Jeannette Taylor to J. Fenimore Cooper, supra p. 683. Ed.)

[9] Private Letter Book of Robert Morris. Library of Congress, Washington, D. C.

[9] Revolutionary Reminiscences connected with the Life of Robert Morris, Esq. By Redwood Fisher. Graham's Magazine, January, 1854, Vol. XLIV, p. 17.

[10] Griffin's Life of John Barry. Phila., 1903, p. 412.

any more than he presented it to Barry, as claimed by Barry's biographer."

Dale received the sword from Barry, who had received it from Robert Morris, to whom it was sent by the heirs of Paul Jones.

The detailed and exact story of the disposition of the sword presented by Louis XVI to John Paul Jones, as here given, has, as far as I can find, never before been told and it is too important to be lost, although the general facts have been known to many students of history.

" Martin I. J. Griffin in American Catholic Historical Researches, for 1905, pp. 216 and 383.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ARMOR AND SPEED (VITESSE, C'EST FAIBLESSE).

By E. BEAUFAILHY.

Translated from *Le Yacht* by PHILIP R. ALGER.

There is no truce in the warfare of discussion between the partisans of armor and the advocates of speed; for, more and more, the development of one opposes the attainment of the other. Those who hold above all to speed, after having extolled the merits of the "croiseur-cuirassé," to-day demand, more modestly, the construction of "cuirassés-croiseurs." Those who, following the path first traced by Augustin Normand, the illustrious and much regretted constructor, willingly make a sacrifice of rapidity of movement, pronounce for the "cuirassé" (without qualification). The six 18,300-ton ships of the new program belong between the two types; less armored than the battleships of the 1900 program; neither will they realize the speeds of 22 and 23 knots which certain foreign powers contemplate for their battle squadrons; their protection, without being excessive, is serious.

It is high time that we should take a definite stand, either for or against armor as opposed to speed, and in this connection it may be well to set forth some of the thoughts which militate in favor of armor.

Let us observe, in the first place, that speed is an essentially precarious quality. We do not mean by this merely that a fast ship may be stopped or slowed down as a result of injuries, but also that a speed remarkable at one time is considered ridiculously small some few years later. It results that such a ship, of boasted speed, will very soon be far surpassed; so that speed is a sort of fashion, which changes from season to season. It cannot be denied that the effect of time is much less sensible upon well protected ships; these preserve much better the quality they possess of not fearing blows and of remaining useful.

It is only necessary to run over the list of our ships to see that this is so. Already our "croiseurs-cuirassés *Latouch-Tréville, Chanzy, Amiral Charner, Bruix,* launched between 1892 and 1894, and which, with only 3.6-inch armor, had a speed of 18 knots, superb for that epoch, are good for nothing but to serve as school-ships or to form part of squadrons of no fighting value in far-off waters. Even more, the *Guichen, Châteaurenault,* and *Jurien de la Gravière,* though of quite recent construction (1898-1900) are declared unfit for any use. These are big ships, from 7000 to 8000 tons, with 23 knots speed at trial, but they have no side armor; their speed has fallen off; there are 50 million francs very badly invested.

On the other hand, it is curious to note that all the heavily armored ships, even when they have this quality alone, can still serve in case of war. The four *Bouvines,* contemporary with the *Latouch-Tréville,* to this very day form an active squadron; with their 18-inch steel armor, they may for a long time yet be counted in our second line. The *Caïman, Indomptable, Requin,* and *Terrible,* more than 20 years old, carry equally well the weight of years; because their armor is 19.7 inches thick, they can only steam 14 or 15 knots, but their effective protection would allow exposing them to an enemy's fire,—that is enough to prevent any one thinking of selling them. What of the *Tage, Cécille,* etc., of equal displacement, built later? They steam 19 knots; it is long since they have been counted on for any purpose, because their hulls offer no resistance to gun-fire. Thus, this simple review enables us to observe the permanence of the service which effectively armored ships can render in comparison with the short-lived value of fast ships with little or no protection. We will not lay stress upon the absurd ideas which formerly led the different powers to build great cruisers which were, in sum, nothing but passenger steamers armed for war; our contention applies primarily to the "croiseurs-cuirassés," derived from the *Dupuy de Lôme,* which it was alleged could be placed in the fighting line. Is it not now manifest that, for these ships, 2 or 3 knots more speed has not compensated for from 8 to 12 inches less armor at the water-line?

Whatever one may say, the battleship has made good in the last naval wars. The Chinese-Japanese war should have been enough, 12 years ago, to show the error of the adversaries of armor.

The most salient fact of the Battle of the Yaloo, September, 1904, is that when the Chinese fleet was wholly defeated, its two battleships, *Tung-Yuen* and *Chen-Yuen*, although of small size and obsolete type, alone opposed a passive resistance to the guns of Admiral Ito.

The Russo-Japanese war has given us the same lesson. Under the withering fire of Togo's squadron, all of the Russian ships that were not armored were shattered, torn to pieces, and destroyed—the armored ships alone showed resistance. At first the surprise was great at learning that Rozhestvenski's most modern ships, the *Borodino, Souvaroff, Alexander III,* and *Ossliabia,* had been sunk in a few hours. Thence it was but a step, and one quickly taken, to the affirmation that the battleship was a failure. In June, 1905, M. Pelletan wrote: "Tsoushima has just proved that the battleship is as vulnerable as her faster opponent, the cruiser; that the latter can stand up against the former and defeat her." The facts, when better known, have given M. Pelletan emphatically the lie. We now know that, if the Russian battleships turned turtle or sunk, it was because they were so overloaded that their belts were submerged, so that, their thin armor being at the water-line, the *Borodino, Souvaroff,* etc., were nothing but slow armored cruisers. Far from showing the inefficiency of armor, then, the loss of the big Russian ships proves its absolute necessity.

Other examples to support this principle are to be found in a work by a very distinguished engineer, Mr. Ferrand, formerly chief of the Bureau of Naval Construction in the office of the Minister of Marine, in which the battle damages of the Russo-Japanese war are grouped and discussed, and it is shown how thoroughly armor fulfilled its office.

Certainly, neither the Japanese nor the Russian shell were remarkable; their penetration was not always what might have been expected, and there were a great many premature bursts, which fact may serve to console us a little for the similar faults exhibited at our last fleet target practices. Perhaps the injuries would have been greater if the shell had been better. Nevertheless, in view of the results, the value of armor protection must be admitted.

How much more vulnerable speed is! We do not sufficiently consider the damage which may be done in action to the smoke-stacks, engines, boilers. Most of the Russian ships lost, in the first hour's fighting, half their speed; the firing of the boilers became

very laborious, the draft was greatly reduced, and the coal consumption increased. "The only one of the elements constituting the power of warships which cannot be protected," writes Mr. Ferrand, "is speed." "At this time, when in the press and in the parliament nothing is talked of but the quest of the highest possible speed, it is useful to note that the sacrifices made to this end are, in the moment of battle, brought to naught by the smallest projectile." We have too much lost sight of this truth.

The teachings of recent wars, as well as the very force of circumstances, which cause us to retain our old ships with heavy armor, while we strike from the navy list newer ships, fast but unprotected, combine to prove the efficiency of armor. On the contrary, everything shows that it is, and always will be, a matter of chance whether the advantages of speed can be realized. Let us not, then, sacrifice the protection of ships of the line to add to their speed. Armor is the best of weapons; on the other hand, "Vitesse, c'est faiblesse." (Speed is weakness.) Mr. Normand so wrote once, and he knew what he was talking about.

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CHANGING THE PROPELLERS OF THE U. S. S. *HOPKINS*, AT THE NAVAL STATION, KEY WEST, FLA.

By CAPTAIN W. H. BEEHLER, U. S. Navy.

On December 22, 1906, the U. S. S. *Hopkins* arrived at Key West, from Philadelphia, having sustained injuries to both her propellers by grounding on Fowey Rocks.

Upon examination of the injuries sustained, I telegraphed the Navy Department that the old propellers could be removed and new ones replaced at this station, and requested authority to do the work. There were no spare propellers for the *Hopkins*, and these had to be cast from patterns, at the navy yard, League Island.

The work was authorized by telegram on December 26, 1906. The *Hopkins* was hauled into the slip between Coal Shed B and its pier, where the depth of water of eleven feet was such as to enable divers to stand on the bottom while working on the propellers.

The divers began work on December 27, 1906, and work was expedited with the idea of having the old propellers off, and everything ready when the new ones should arrive. It was at first expected that the new propellers would be shipped by the Mallory steamer leaving New York, Saturday, January 12, 1907, in which case they would have arrived on Wednesday, January 16, 1907. The propellers were not finished at the League Island navy yard until March 14, 1907, and they did not arrive at Key West until April 5, 1907.

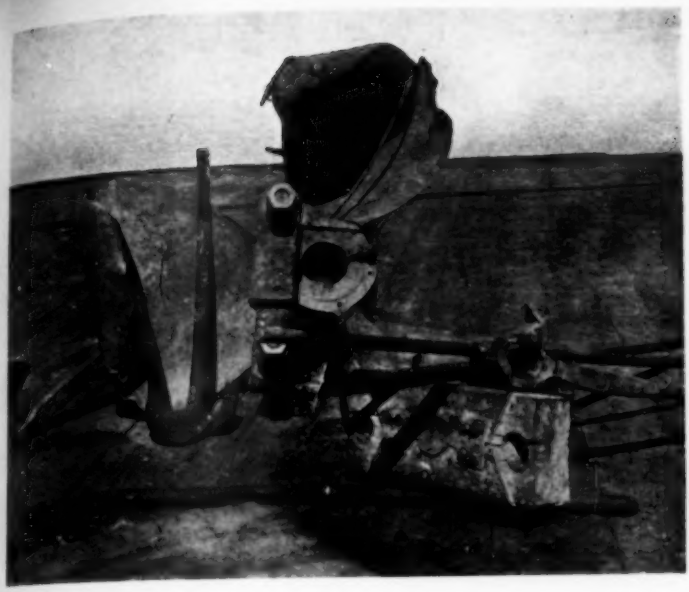
On December 27, 1906, the screws, cap, nut, and keys were removed from the port propeller, without difficulty, by the divers. The operation of unscrewing the nut took considerable time, but

was accomplished by the use of a long-handled wrench, which had to be shifted frequently, worked by tackle hooked in the end of its long handle and operated on deck. After the removal of the nut and keys, greater difficulty was experienced in starting the propeller from its cone on the shaft. The divers were down daily, Sundays and holidays excepted, until January 22, 1907, working on this port propeller.

All three of the blades of the port propeller were badly bent, and one of them enfolded a rock. A screw jack was used to force the propeller off, but owing to the distorted blades, it was difficult to adjust the screw jack to bring effective pressure on the blades to force the propeller from the cone. It was apparent that the force of the blow, when the ship struck, had still more firmly wedged the hub of the propeller on to the shaft. Two 2½-inch machine steel bars were broken in the effort to force the propeller off. A heavier jack and hook rod were made, and the pressure was again applied by setting up the screw nuts. All of this work was done under water, and it required considerable time to screw up the nuts on the screw jack, every turn of which gradually moved the propeller.

After having moved the propeller on its cone about two inches, it resisted further pressure, and it was necessary to split the hub of the propeller, in order to remove it. Holes were then drilled in the hub, and a long diver's knife was used by which the hub was split. After this, it yielded, and finally came off, on January 22, 1907, without having injured the shaft or its cone.

The next day we proceeded with the removal of the starboard propeller. Its cap, nut, and keys were removed without difficulty, but in trying to start the propeller from the shaft, the same difficulty that had been experienced with the port propeller, was again encountered. After spending two days in trying to force the propeller off with the jack, it was found that it would be necessary to split the hub of the starboard propeller, also. This was done on January 29, 1907, and the starboard propeller was finally removed. It required six days' work, whereas the removal of the port propeller had taken three weeks. There was some delay in fixing up the apparatus and in making heavier screw jacks. All of this work had to be done by the blacksmiths, by hand. There were no well adapted appliances at hand. Such as we used, had to be improvised.



BROKEN PORT PROPELLER, U. S. TORPEDO-BOAT DESTROYER "HOPKINS," U. S. NAVAL STATION, KEY WEST, FLA., JAN. 23, 1907.

BROKEN STARBOARD PROPELLER, U. S. TORPEDO-BOAT DESTROYER "HOPKINS," U. S. NAVAL STATION, KEY WEST, FLA., FEB. 1, 1907.

The removal of propeller blades from destroyers will probably be frequently required, and there should be a regular tool available at every torpedo boat base, which would save much time in this operation, whether it is done by divers, under water, on a marine railway, or in a dry dock.

Both propellers having been removed, the *Hopkins* was, on January 29, 1907, hauled into the slip between the north side of the approach to Pier B and the U. S. Lighthouse Establishment pier. In this basin there is much more room to work.

It was necessary to improvise pontoons, to form something like a floating drydock, by which the after body of the *Hopkins* could be raised to give the incline to the shaft, by which the new propellers could be put on.

The propellers were expected daily during the months of February and March, while everything was ready at this station, but the propellers were not shipped until March 14, 1907. Then, instead of being shipped by the Mallory line, from New York, on the steamer leaving March 16th, direct to Key West, they were sent by the Clyde Line to Jacksonville, thence by rail to Miami, and thence by steamer to Key West, where they arrived and were delivered in the afternoon of April 4, 1907. Had they been shipped by the Mallory steamer on March 16, 1907, they would have arrived on March 20, 1907, and the work would have been finished three weeks earlier.

Upon the arrival of the propellers, the Department of Steam Engineering received them, and drilled screw-holes in the hubs for screwing on the caps.

Ashlighter No. 1 was fitted with windlass, chocks, etc., and both propellers were put on board. The port propeller was suspended by chains and tackle from the roller chock on the ashlighter. Two coal lighters were filled and sunk, and the after body of the *Hopkins* was suspended from them by chains. The coal lighters were then pumped out, lifting the after body of the *Hopkins* about one foot. The divers got the port propeller on the shaft and keyed it in place in the forenoon of April 6, 1907. The nut was then put on the port propeller, but one of the screw threads was found to be slightly burred, and that had to be filed smooth. On Monday, April 8, 1907, the starboard propeller was put in place, its nut screwed home and keyed, and its cap screwed in place by the next forenoon, April 9, 1907. Work was resumed that after-

noon with the nut on the port propeller. This was finished at 9 a. m., April 10, 1907. Zinc plates were then screwed on, the work was finally completed at 10.30 a. m., April 10. The entire time employed in putting on the propellers was twenty-seven hours, and the total cost was $176.18, including the cost of one day's work drilling the holes in the hub, by the mechanics of the Steam Engineering force.

This work was done by two divers and two riggers, employed in the equipment department of this station. There was no mechanic employed, the only mechanical work done was the drilling and tapping of the screw holes for the caps in both propellers, before they were placed on the barge to be put on the shafts. These divers and riggers deserve great credit for their excellent work in rigging the barges to carry the propellers at a certain depth, at which the divers could handle the propellers easily under water. The sunken barges, about two feet above water, furnished an admirable place for work with the divers. The sunken coal barges were pumped out by the pumping barge operated by the crew of the station launch, and also by the pumps on board the *Hopkins*. The crew of the *Hopkins* assisted in hauling on the tackle in the end of the wrenches to screw the nut home. The wrenches had to be shifted frequently for each turn, and it took two and one-half hours to advance the screw home on its threads. The key of the nut could not be inserted until the nut was completely home so that when the keys had been inserted, it was absolutely certain that the propeller was chock home in its place, on the shaft. April 10, at 2 p. m., the *Hopkins* left the basin at Pier " B " under her own steam and went out on a trial trip along the keys to American Shoals. On this trial trip everything worked satisfactorily; the engines were put to severe tests, both backing and going ahead, and the trial trip demonstrated that the propellers had been properly put on. The new propellers are balanced, and very much better than the old ones. These balanced propellers entirely obviate the excessive vibrations which had been previously experienced with the old propellers. The *Hopkins* then re-joined the second flotilla and sailed in company with the second flotilla on April 12 for Norfolk. The old propellers were put on board the U. S. Naval Collier *Cæsar*, and sent to the navy yard, Norfolk.

Chief Gunner Charles Morgan, U. S. N. (retired), had personal supervision of this work. It was, in all respects, a seaman's job,

PLACING NEW PROPELLERS ON TORPEDO-BOAT DESTROYER " HOPKINS," U. S. NAVAL STATION, KEY WEST, FLA., APRIL 6, 1907.

and no skilled mechanical work was required to remove the old propellers and put on the new ones. The manner in which the work was done, thoroughly illustrates the possibility of taking advantage of resources not especially designed for the purpose. The coal lighters proved to be excellent pontoons, and their use is indicative of what may be accomplished by the use of pontoons to simulate a floating dry dock.

A marine railway, capable of taking the largest destroyers and tugs, is now under construction at the naval station, Key West. The necessity of such a marine railway at this station, is very urgent. Torpedo boats and destroyers will necessarily be very largely employed at Key West, for the command of the straits of Florida; and an ample, commodious torpedo boat depot should be established at Key West. The island of Fleming Key was transferred to the Navy Department for use as a naval depot, in 1855, and it is so recorded in the deeds of the land office. This island lies adjacent to Man-of-War Harbor, in which and out to the Straits of Florida, through the main ship channel, there is a depth of thirty feet of water.

This island of Fleming Key contains about sixty-six acres, that would be enclosed by a quay wall. The island itself only comes to within two feet of the surface of the water at low tide. It is covered with mangrove. A quay wall on this rock, enclosing that area, would also enclose commodious slips, and it is an ideal place for a torpedo station. There is an artificial island, which has recently been thrown up north of the island of Key West, and which is known as "Trumbo's Island," the name of the contractor who has charge of building this artificial island. This island is to be the terminus of the Florida East Coast Railroad. This so-called "Trumbo's Island," is separated from the island of Key West by a channel, and its eastern side fronts on Man-of-War Harbor, with a depth of water of thirty feet. Twelve docks and piers have been designed to be built on the eastern edge of Trumbo's Island, for the F. E. C. R. R.

This island is separated from Fleming Key by a channel about five hundred feet wide, which secures railroad communication to Fleming Key, by which ample supplies can be taken to a torpedo depot there.

The commerce that passes through the Straits of Florida is practically all that which comes from Texas, the oil from Port Arthur

and Galveston, all the commerce from the Mississippi, through New Orleans, the sugar and cotton from the Gulf States, the lumber from Pensacola and exports from Mobile, and other Gulf ports; all the commerce of the Republic of Mexico, and the greater part of the commerce from Cuba, all pass Sand Key, all of which will be commanded by the naval forces at Key West. Key West is the nearest point of the United States to Panama, and the bulk of the commerce of Panama Canal will also pass Sand Key, so that Key West is the greatest strategic point of our country.

The important strategic position of Key West on the route of this immense commerce, demands that there should be docking facilities here at Key West. A site for a dry dock was selected by the father of the present Senator Mallory before the Civil War. This site is in front of the Marine Hospital, but it seems that it would be preferable to have a basin at this site for a floating dry dock. This floating dry dock could be towed out into the channels to deep water or to Dry Tortugas, and injured vessels could be placed upon the dry dock and towed into the slip through channels of not less than thirty (30) feet of water. It is probable that an injured battleship might require ten fathoms of water in which to be docked, but after the battleship was placed upon the dry dock, there would be no difficulty in towing the dock with the battleship up to the basin. The draught of the floating dock would be less than twenty-four (24) feet carrying the battleship. I saw the big German Transatlantic liner, *Kaiser Wilhelm der Grosse*, placed upon a large floating dry dock at Cuxhaven and towed to Blohm & Voss ship yard at Hamburg. The steamship required a new rudder-post and while on the floating dock, the dock is on a level with the ground of the ship yard, and was readily hauled under a one hundred-ton crane and round in slips adjacent to shops, facilitating the transportation of heavy weights by which the ship was repaired at a cost very much less than would have been possible with a graving dry dock, and in very much less time.

There are some difficulties to be overcome, but they are not insurmountable, and taking into consideration the natural advantages that do exist, it is only a question of time when such docking facilities will be available here at Key West. The extension of the railroad to Key West and the construction of the Panama Canal, to which Key West is three hundred miles nearer than any other United States point, makes it evident that there should be no

delay in providing Key West with proper docking facilities as soon as possible.

The keys along which the railroad is being built, to be in operation this year, will leave channels where flotillas could operate for the mobile defense of the Straits of Florida.

These waters should be thoroughly examined by fleets of torpedo boats, and operations should be conducted to illustrate their value. This is a work of preparing for war which should be done in time of peace, and, in the event of war, our flotillas would be thoroughly familiar with the hydrographic conditions of this coast, and along the line of the railroad.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

EFFECT OF MOVEMENT OF THE GUN-PLATFORM ON THE TRAJECTORY.

By Lieut.-Commander H. O. STICKNEY, U. S. Navy.

The statement has been made and very generally accepted, that, "if a ship were anchored and a torpedo boat steamed by at a speed of 30 knots, at a distance abeam corresponding to 3 seconds time of flight for any particular gun, in perfectly calm weather, the projectile from the gun in question, if accurately aimed, would hit the torpedo boat in the point of aim. If, however, the torpedo boat fired at the anchored ship, at the same moment and with the same class of gun, she would not hit the ship in the point of aim if her sliding leaf were set at 30 knots, *on account of the effect of the apparent thirty-knot head wind created by her own motion.*"

The italics are my own, and the cause here assigned for the failure of the torpedo boat to hit the ship in the point of aim under the above conditions appearing erroneous, let us examine, in an elementary manner, into the various forces acting on the projectile, in order to ascertain what the true cause of failure may be.

Let us consider first the simplest case: that of a vessel at anchor firing at a torpedo boat steaming by at a speed of thirty knots, at a distance corresponding to three seconds time of flight for the gun in question. Assume a perfect sphere for the projectile, eliminating consideration of drift—which does not concern us at present. A perfect calm prevails.

Referring to Fig. 1, it is evident that if T is steaming by at a speed of thirty knots, for instance, at a range such that the actual time of flight of the projectile is three seconds, it will move 152.1 feet in the time of flight; therefore, if the *gun* is pointed at T_1 when fired, T and the projectile will arrive at T_1 at the same instant, and we hit the moving target. In other words, (the sliding

leaf being graduated for a time of flight of three seconds, and allowing for the actual motion of the target perpendicular to the line of fire), if we set the sliding leaf for a thirty-knot speed and

FIG. 1.

T = Target, steaming at 30 knots.
A = Gun platform, at rest.
Time of flight of projectile, 3 seconds.

aim accurately at a target steaming by at thirty knots, at a range corresponding to three seconds time of flight, the projectile will hit in the point of aim, provided the course of the target be perpendicular to the line of fire.

The angle TAT_1 makes a perfect correction only at one range, because the actual time of flight does not vary directly as the range.

At all ranges greater than the one for which the leaf is marked the projectile will fall in rear of the point of aim, because the time of flight increases more rapidly than the range. And, similarly, at shorter ranges the shot will strike a little ahead of the point of aim on the moving target.

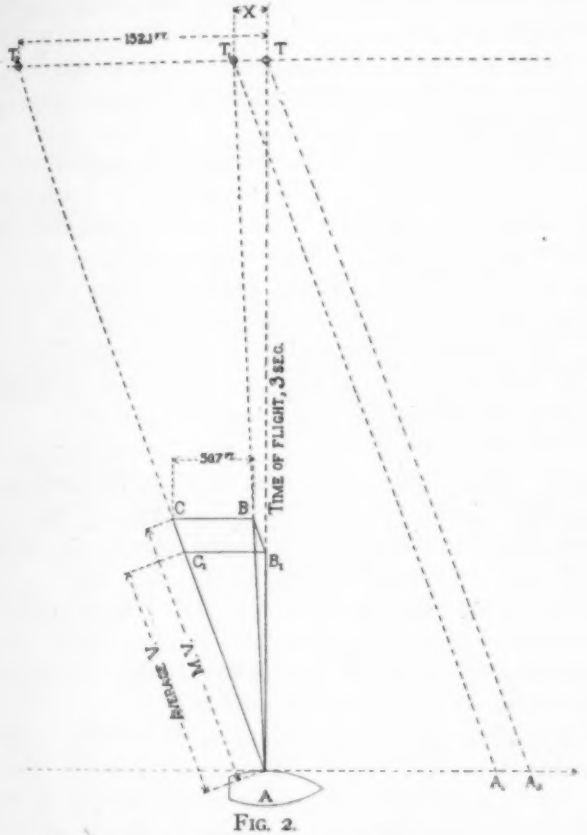


FIG. 2.

A = Firing ship, steaming at 30 knots.
T = Point of aim, abeam, at rest.
T_1 = Point toward which projectile starts.
T_2 = Point toward which gun is pointed when fired.
$CB = C_1B_1 = S$ = Speed of firing ship in feet per sec.
t = Actual time of flight of projectile, in sec.
t_1 = Time of flight if there were no retardation, in sec.
R = Range in yards.
$T_2T_1 = AA_1$ = Distance ship moves in time, t_1.
$T_1T = AA_2$ = Distance ship moves in time, t.

Let us now consider the case of the torpedo boat steaming by, and firing at the ship at anchor with the same class of gun.

Referring to Fig. 2, we find, at the instant the projectile leaves the muzzle of the gun, that it has two forces acting upon it beside gravity, and at that instant both these forces cease to act. These two forces: the pressure developed by the powder, and the force moving the ship through the water, produce two velocities, viz., the muzzle velocity of the projectile in the direction of the axis of the bore, and the velocity of the ship in a direction parallel to the ship's course.

The resultant *velocity* is, for all practical purposes, the same as if the projectile were fired from the gun at rest—when firing at a target nearly abeam. The nearer ahead or astern is the target the more the velocity is changed (amounting to 50.7 f. s. when firing directly ahead or astern while steaming at thirty knots), and the less becomes the lateral error, due to the speed of the ship. The resultant *direction* of motion given to the projectile can be graphically determined by the simple principle of the resolution and composition of forces and velocities.

Let AC represent the M. V. both in magnitude and direction and draw CB, to the same scale, equal to the speed of the ship in magnitude and direction; then the resultant of these two is AB, representing the actual direction and velocity of the projectile when it leaves the muzzle of the gun.

Owing to the fact that the projectile is retarded in its flight by the resistance of the air, its actual time of flight is, of course, greater than would be the case if its velocity remained, throughout its flight, constantly equal to the M.V.

It is evident, by similar triangles, that if the projectile did maintain its muzzle velocity throughout its flight, the distance T_2T_1 would equal AA_1, the distance the ship moves in the time t_1, and, consequently, if the point toward which the gun is directed were at a distance to the left of the point of aim equal to the distance that the ship would travel in this time, t_1, then the projectile, with muzzle velocity maintained, would strike the point of aim. And, similarly, if the projectile started at, and maintained a velocity equal to the *average* velocity of its actual flight over the range, it is evident that if the point T_2, toward which the gun is directed, be at a distance to the left of the point of aim equal to the distance the gun platform moves in the actual

time of flight, t, the projectile, maintaining this average velocity, will hit the point of aim.

But neither condition obtains, and the true direction in which the projectile starts when it leaves the muzzle is the resultant, not of its average velocity and the velocity of the ship, but of its muzzle velocity and the velocity of the ship. In either case the component due to the ship's speed is of course the same, while the muzzle velocity is greater than the average velocity; and, consequently, the actual resultant, AB, points more to the left than would the resultant, AB_1, of the *average* velocity compounded with the speed of the ship; and the distance T_2T_1 is the distance the ship travels in the time, $t_1 = \frac{3R}{\text{M.V.}}$. Therefore, the shell *starts* toward a point, T_1, lying on that side of the point of aim (and distant X feet from it) which is toward the stern of the firing ship, when using a sliding leaf marked and set so it would correct accurately if the target were moving and the gun platform at rest. This is not due to the effect of the apparent head wind, but simply to the fact that the muzzle velocity is greater than the average velocity.

If we know the range, the time of flight, the M.V., and the speed of the ship, then the distance, X, is at once found as follows:

$$X = S\left(t - \frac{3R}{\text{M.V.}}\right)^{*}. \qquad (1)$$

For example:

(a) A ship steaming at a speed of ten knots, fires a six-inch (30 cal.) B. L. R., with the sliding leaf set for ten knots speed, at a stationary target abeam, distant 1600 yards. M.V. is 2000 f.s. What will be the distance the shell will fall off the point of aim, due to retardation in its flight?

Reference to ballastic tables for this class of gun gives the corresponding time of flight to be 2.69 seconds.

$$X = 16.9\left(2.69 - \frac{4800}{2000}\right) = 4.9 \text{ ft.}$$

*Formula (1) is obtained thus:

$$T_1T = X = T_2T - T_2T_1 = St - St_1$$

but,
$$t_1 = \frac{3R}{m.v.} \text{ (see fig. 2)}$$

$$\therefore X = s\left(t - \frac{3R}{m.v.}\right)$$

(b) If the M.V. be 1700 f. s., then t is 3.29 seconds, and

$$X = 16.9\left(3.29 - \frac{4800}{1700}\right) = 7.9 \text{ ft.}$$

(c) With a 6-pdr. R.F. gun, M.V. 1818 f. s., t is 1.94 seconds for a range of 1000 yards, and

$$X = 16.9\left(1.94 - \frac{3000}{1818}\right) = 4.9 \text{ ft.}$$

In these examples actual M.V. and times of flight are used for the class of gun considered, and it will be observed that these hold good only for the ogival projectile, for which the tables are computed, and not for the "perfect sphere" we have assumed. It is evident, however, that the shape of the projectile does not affect the fact that the direction and value of the resultant, AB, Fig. 2, depend alone upon the direction and value of AC and CB. Therefore, unless some force acts on the ogival projectile after it leaves the gun, other than the forces which would act on the perfectly spherical projectile previously assumed, then, like the perfect sphere, it will continue in the vertical plane passing through AT_1 until it strikes.

We see it is easy to determine the actual direction in which the projectile *starts*, and, since it is dead calm, there can be no motion of air across the vertical plane through ABT_1, in which the projectile starts, no matter at what angle it may be fired. There is, therefore, no force to cause it to deviate laterally (reverting for a moment to the perfect sphere and neglecting drift due to rotation of projectile), the only forces acting being inertia, resistance of air directly opposed to the direction of motion of projectile, and gravity. And without force acting to produce motion, or a change of motion of any mass, there can, of course, be no motion or change of motion, no matter how slight. The sphere must, then, under the assumed conditions, continue to travel in the same vertical plane until it strikes.

To illustrate in a simple manner the fact that a projectile fired from a ship in motion is not affected by the *apparent* force of wind, refer to Fig. 3, and suppose the ship moving, first, in the direction AB at twenty knots speed, against a twenty-knot breeze, and we point the gun at such an angle TAT_1 that the projectile (still considered spherical and without drift) starts in the direction AT, which is, of course, simply the resultant of the speed of the ship in direction AB and the M.V. in the direction AT_1.

From the instant it leaves the muzzle, it has but four forces acting on it, viz: inertia, resistance of the air in a line directly opposed to the direction of motion, a force acting to carry it to the left, due to the actual movement of the air across AT, and gravity. The result is that the projectile is carried off to the left to T_3, by the only force which is not acting in the vertical plane through AT.

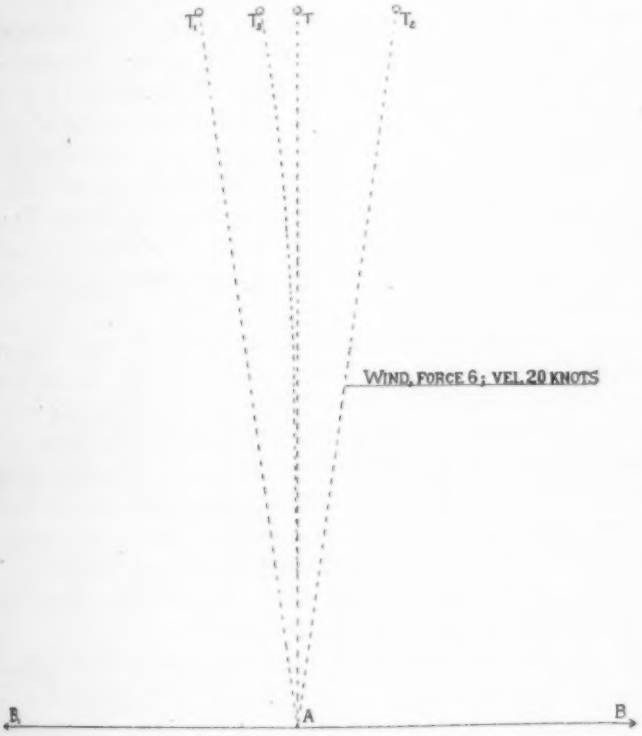


FIG. 3.

Now, suppose all the conditions remain exactly the same, except that the ship is steaming in the opposite direction, AB_1. The shot is fired at the instant the muzzle of the gun is at the same point as before, A. It is plain that the angle TAT_2, at which the shot must be fired in order to start in the same direction as before, AT, is the same as the angle TAT_1, this angle being dependent only on the speed and direction of motion of the ship,

and the M.V. and the direction in which the gun is pointed, as we have seen before. The result, then, is that the projectile on leaving the muzzle at A, starts off in the same direction as before, AT, if the correction on the sliding leaf is in the opposite direction and exactly the same in amount as in the previous case, where the ship was steaming toward AB. And from the instant it leaves the gun, the projectile is subjected to precisely the same forces as before, and must, therefore, strike at T_2, as before.

But, when steaming in direction AB, we had an *apparent* force of head wind of forty knots, and when steaming in direction AB_1, we had an *apparent calm*. If, in each of these cases, a dead calm prevailed, then we would have an apparent head wind of twenty knots, but it is evident that, there being no real movement of air across AT, the force due to this is eliminated, and both the projectiles, having started from A in the same direction, AT, and being acted upon by no forces except the three mentioned, in the vertical plane through AT, will (if perfect spheres) continue on in the same plane and strike at T.

We have, up to this point, considered only the case of a perfect sphere as the projectile, neglecting drift, and have found that it strikes (when fired abeam from a ship moving ahead) a little on that side of the fixed target which is toward the stern of the moving ship, if we use the same sliding leaf correction as used for firing at a moving target with the gun platform at rest; we have seen why it does so, and can calculate exactly how much the error is. But when we take the case of the ogival projectile, we find that another lateral error creeps in, additive to the error already found, and not so easily determined.

Refer to Fig. 4. Assume a dead calm and neglect drift due to rifling. Ship steaming to the right. Let the angle TAT_1 be the correct angle at which the gun must be pointed in order for the shot to start off toward T.

On leaving the muzzle, the projectile is travelling in direction AT, but its axis is pointed in direction AT_1 at an angle, L, with AT, and the rotation of the projectile tends to hold its axis parallel to this direction. The projectile is not a perfect sphere, nor is it uniform in density. The resistance of the air is directly opposed to the direction of motion and is acting in the line cp, which passes through the center of figure of the projectile, as seen projected on a plane through the shell perpendicular to its

trajectory. And this line will pass on that side of the ogival point which is toward the ship's head. The air is therefore banked up on this side, and the projectile is made gradually to curve off toward the stern of the firing ship, until the axis of the projectile adjusts itself to the direction of motion. The lateral error thus

FIG. 4.

caused may be small in amount, but such as it is, it increases the error already found.

It may be of interest to mention still another lateral error, so small, however, as to be quite negligible, which would result from continuous aim if this were actually kept up while the shell

traverses the bore, and which is also additive to the two already discussed. If Z equals the velocity in f.s. (relatively to the ship) of the muzzle of the gun training aft to keep on the target, and L equals the distance in feet, horizontally, from the muzzle to the point about which the gun trains, then $Z = LS/3R$. The effect would be to decrease (in Fig. 2) the component CB by the value of Z, and if it were desirable to take this into consideration formula (1) would become:

$$X = S\left(t - \frac{3R - L}{\text{M. V.}}\right).$$

The effect on the value of X is thus seen to be inappreciable, even if continuous aim were actually maintained while the shell traverses the bore.

It seems quite clear from the foregoing that no correction is required for the *apparent* force of the wind.

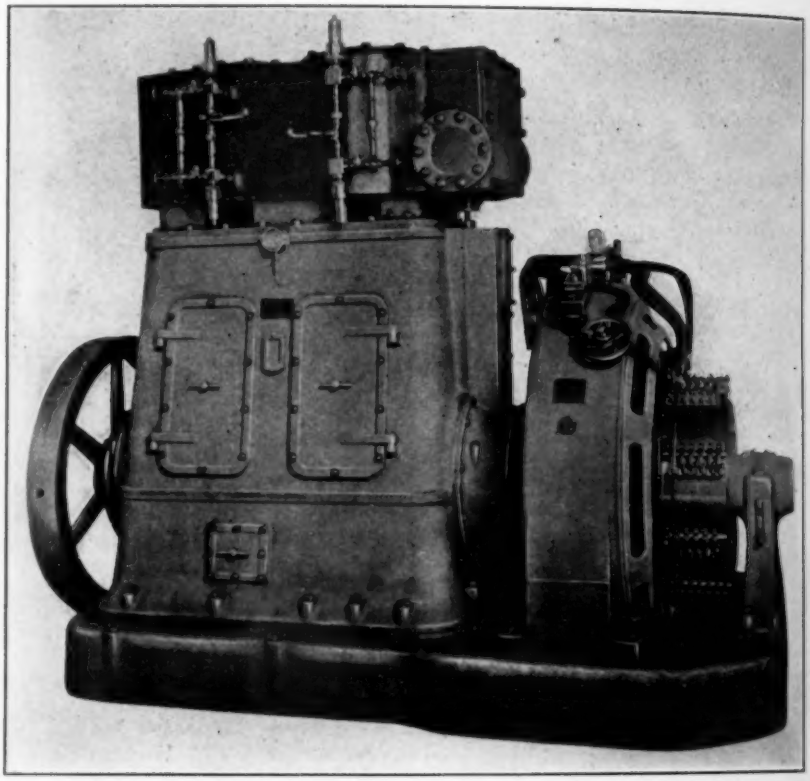
Of the two lateral errors that are considerable, which do act to produce the failure of the torpedo boat steaming by to hit the ship at anchor in the point of aim, under the conditions quoted in the first paragraph, one is found to be easily calculated. The other can be determined only roughly by extended experiments, after drift has been determined for each range at which experiments are carried out.

NOTE.—This paper was not prepared with the expectation of upsetting any existing methods of calculating deflection of projectiles which it is known do give close approximations to actual results found experimentally, nor is the accuracy of these methods questioned; but it is believed that some good will result from a careful study of the forces actually at work on a projectile after it leaves the muzzle, dropping for a moment the application of higher mathematics.

The object sought was to show that such lateral deflection of projectiles as is actually due to the speed of gun platform is produced by the effect of this speed of gun platform on *their initial direction*, and that this initial direction, or plane of departure, is found simply by compounding the m. v. proper with the speed of the gun platform. And hence, that it is erroneous to say this deflection is produced by the force of an apparent head wind created by the speed of the ship.

An expression is also given by means of which this deflection may be found.

The value of studying the subject from this point of view is shown by the tenacity with which some who are well versed in exterior ballistics maintain that a perfect sphere, after having started in the actual plane of departure as determined above, afterwards departs in a curve therefrom *by reason of the fact that its m. v. is very large in comparison with the speed of gun platform.*



100 KILOWATT GENERATING SET.

GENERAL ELECTRIC COMPANY.

ELECTRICAL INSTALLATIONS OF THE UNITED STATES NAVY.—Continued.[1]

A MANUAL OF THE LATEST APPROVED MATERIAL, INCLUDING ITS USE, OPERATION, INSPECTION, CARE, AND MANAGEMENT, AND METHOD OF INSTALLATION ON BOARD SHIP.

By COMMANDER BURNS T. WALLING, U. S. Navy, and JULIUS MARTIN, E. E., Master Electrician of the Equipment Department, Navy Yard, New York.

CHAPTER VIII.

MOTORS (Continued).

Ammunition Hoist Motors.

There are two varieties of ammunition hoists: that in which a whip is used for hoisting the car or weight; and that in which an endless chain is operated by the motor, the weights being attached to convenient parts of the chain. Officially the term "Whip Ammunition Hoist" is restricted to 6-pounder and like hoists. On board ship the ammunition hoists are generally designated by the caliber of the gun to be served; as 12-inch hoist, 8-inch hoist, 6-inch hoist, etc.

13-Inch and 12-Inch Hoists.

Each gun has its own separate hoist.

The whip, a flexible steel-wire rope, is attached to the ammunition car; it passes over guide sheaves at the upper end of the ammunition track and leads down to a drum which is geared to the motor.

The Motor.—One type of shunt motor, installed in the *Kearsarge* class, is shown in Fig. 149. It is of the enclosed armored type, having its field excited at 80 volts. It gives a rated output of 20 horsepower, for a rated input of 110 amperes at 160 volts, operating at a speed of 350 r. p. m. The motor is similar in constructional details to the turret motor (Fig. 143). Fig. 149 also shows the gear case, brake wheel, and the solenoid brake for this type of motor (see Fig. 140).

The latest design has an output of 55 horsepower at 125 volts for a speed of 400 r. p. m., this large output being necessitated by the additional power required for operating the automatic doors

[1]To be continued in succeeding numbers of the PROCEEDINGS and on completion to be published in book form.

in the turret. The drum is also made larger and scored to receive the fall of the whip, which leads over the pulleys and is attached to the ammunition car at its fall end. The motor for

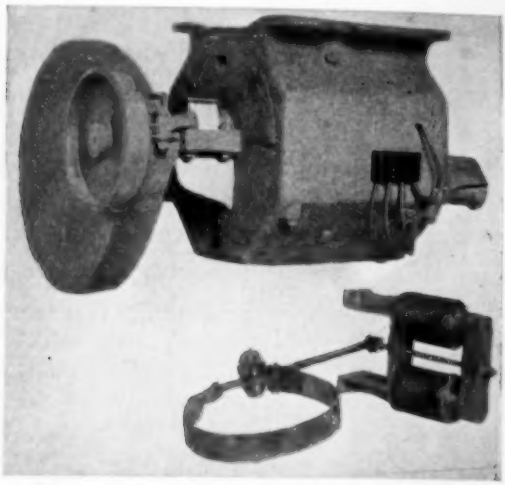


FIG. 149.—13-inch ammunition hoist motor with solenoid brake.

this design is similar to that of Fig. 149, but has a more efficient type of brake, known as the disc type.

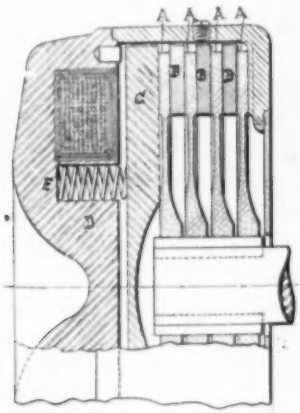


FIG. 150.—Disc brake. Half cross-section.

The Disc Brake.—The type is shown in half cross-section in Fig. 150.

The discs, *A*, are of bronze, and are slipped over two feathers on the shaft, the latter diametrically opposite; these discs, therefore, run with the shaft.

The collar rings, *B*, are of cast iron and are slipped in, free to move in the direction of the shaft, on keys or lugs on the inner periphery of the enclosing casting, which keys prevent the collar

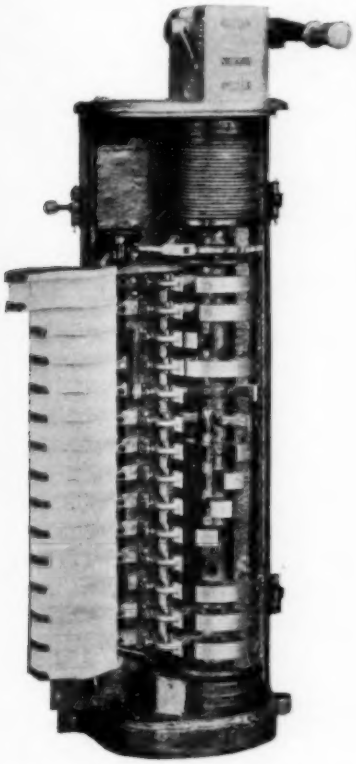


FIG. 151.—Controller for 8-inch ammunition hoist.

rings from turning. The armature, *C*, of the electro-magnet, *D*, also slips on over the shaft feathers but is free to move in the direction of the shaft, and, when no current is passing, is held off from the magnet by eight springs, *E*.

As long as the controller is operating in other than the "off" position, the magnet, *D*, attracts the armature *C* and hence holds the brake released: At the "off" position the magnet releases

the armature, *C*, which presses a disc against one of the collar rings, *B*, and, as all these rings can move in the direction of the line of the shaft, all rings come into action and the friction brings

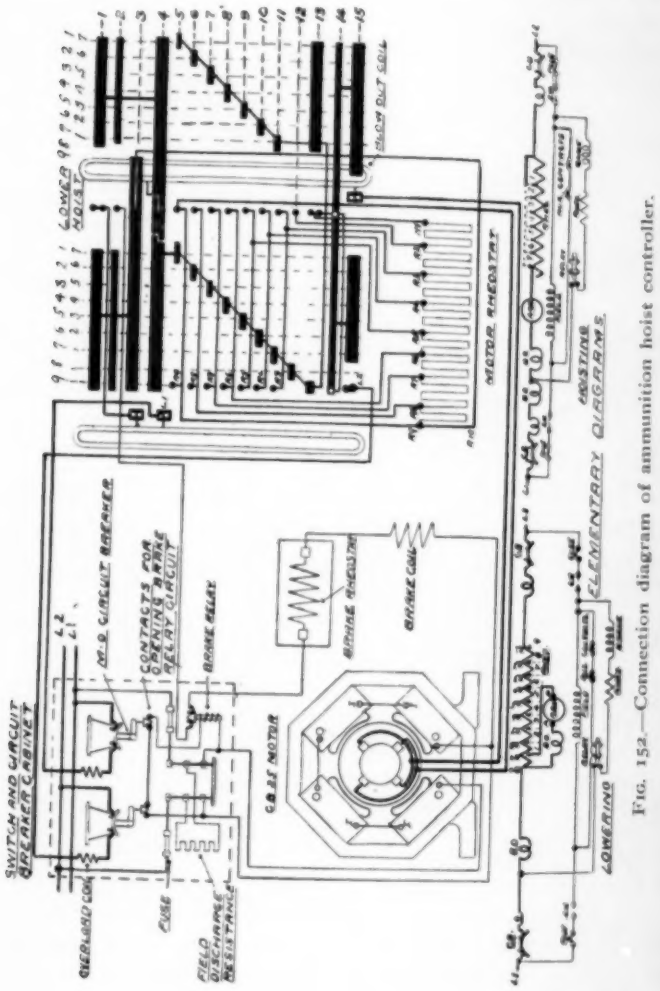


FIG. 152.—Connection diagram of ammunition hoist controller.

the motor to rest; this action is assisted by thinning the discs, *A*, near the center, giving a spring effect. The discs being of bronze and the rings of cast iron ensures against "freezing" by corrosion.

Controller.—The type of *controller* used is that known as the B controller, designed to give an electrical braking effect by the dynamo action of the motor armature for the Day System of Control. The B-28 type for control of the 8-inch hoist motors is shown in Fig. 151. The B-44 type used with the 12-inch hoist motors is similar.

In this controller the lever is arranged to revolve the cylinder by means of bevel gears: To hoist the ammunition car the lever is raised; to lower, it is pushed down, thus following the direction in which the car is to be operated. There are seven hoisting and nine lowering speeds.

In tracing the controller and other connections shown in Fig. 152, the controller development being there shown for the "off" position, it will be noted that the leads to the motor are short-circuited through the blow-out coil, via R_{10}, Rg, and the finger of contact 5, giving the armature braking effect, should the inertia of the armature tend to continue its revolution when the controller is at the "off" position.

The office of various contacts are:

In Hoisting.—The contact 4 (side of diagram) being in contact with its finger moves over the contact with the positive side of the line, but, just before this, contact 16 closes circuit with its finger, hence the blow-out coil is ready to operate as soon as contact 4 closes with the line. At the position 1 (top of diagram) contact 11 throws in all resistance from R_3 to R_{10}, inclusive, and as the controller moves on to position 7, the resistance is gradually cut out until at position 7 the motor armature receives the full potential of the line. Contacts 1 and 2 serve to connect the line to the brake relay and, being in connection throughout the seven positions, the brake magnet is energized and its armature holds the brake released. Should the voltage fail the relay will open the brake circuit and set the brake.

In Lowering.—The first position of the controller has practically little resistance in circuit; the dynamo action occasioned by the weight of the car producing an electromotive force to control any rush of current, any farther motion of the car is afforded by the other eight positions. Stopping is effected by a quick movement to the "off" position, which sets the brake. In both cases, lowering and hoisting, the motor field is energized by separate excitation through connection to the main switch, which has a

high resistance shunt to protect the field circuit from self-induction. One leg of the brake circuit is tapped off the motor field circuit, the other connection of the brake relay leads to the controller.

Automatic Shutter Device.

The automatic shutters are installed to shut off the handling room from the loading space in the turrets, except for the short time that the ammunition car is passing up or down through the shutter opening. The opening and closing of the shutter are effected by the lengthening and shortening of the bights of the shutter-operating drum ropes.

The shutter-operating drums are driven from the ammunition-hoist drum shaft through spur gears, ratio 2 to 1, so that the shutter-operating drums make two revolutions for every revolution of the ammunition-hoist drum.

The complete cycle of events for a round trip, up and down, of the ammunition car are as follows: When the ammunition-hoist drum has made 2¼, and the shutter drum 4½, revolutions, the "leading" ropes on the latter enter the first spiral grooves; this occurs when the car is about 30 inches below the shutter opening, and the bights begin to shorten on the opening drum, and lengthen on the closing drum, the shutter begins to open and continues to open to approximately the vertical by the time the car has reached the middle of the shutter opening. As the car rises the ropes on the closing drum begin to shorten, closing the door by its own weight and the action of the drums, the closing beginning at the time the car is about 6 inches above the shutter.

In lowering the car the operations of the shutter are reversed, opening where it closed before and *vice versa*. Flexible steel tiller rope of ⅜-inch diameter, is used (75 feet for the opening and 65 feet for the closing).

8-Inch Hoists.

Except for differences due to weights to be handled the general arrangements for the 12-inch and 8-inch turrets are the same.

The motor is of the same general design, with similar controller, disc (or solenoid) brake on the commutator end, and with similar type of connections.

The motor output is 15 horsepower at 600 r. p. m. and 125 volts, each gun having its own motor service, as in the larger turrets.

The controller gives six hoisting and eight lowering speeds.

The motors handle automatic shutters in these turrets, as in the 12-inch, the general design being the same.

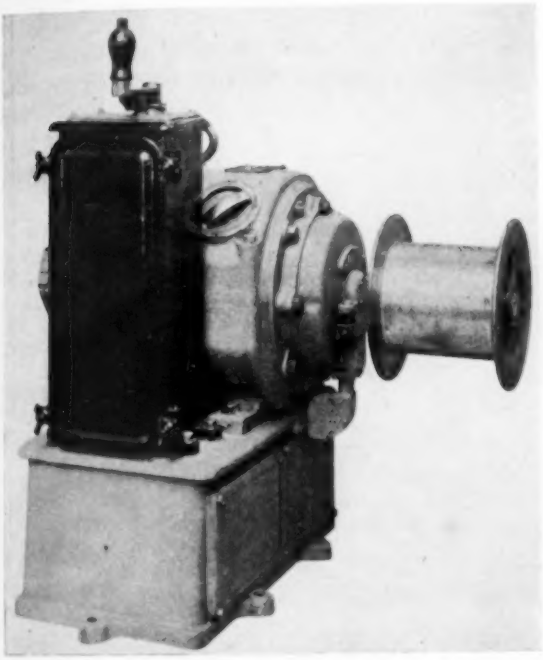


FIG. 153.—Whip hoist equipment.

Whip Ammunition Hoists.

These hoists are auxiliary to the ammunition supply from the chain ammunition hoists, and serve to deliver ammunition from the landing platform of the chain hoist on the berth, main, or upper deck to bridges or tops.

Their arrangement differs somewhat in different ships, but in the latest types the motor is mounted directly on the davit and connected by double reduction gears to a drum shaft carrying a 9-inch composition hoisting drum, over which passes the whip fall leading through the block at the davit head.

A complete whip-hoist motor assembly, as installed on the *Nebraska*, is shown in Fig. 153.

The motor is 3 horsepower, at 125 volts, speed 1100 r. p. m., and similar in construction to those used for the chain ammunition hoists and conveyors.

The controller is of the B-type, and its connections (Fig. 154) indicate in general a similarity in operation to that for the 12-inch hoists, but being smaller the cylinder is revolved by a simple handle on a lever, with thumb latch. The controller provides five speeds for hoisting and seven speeds for lowering, the con-

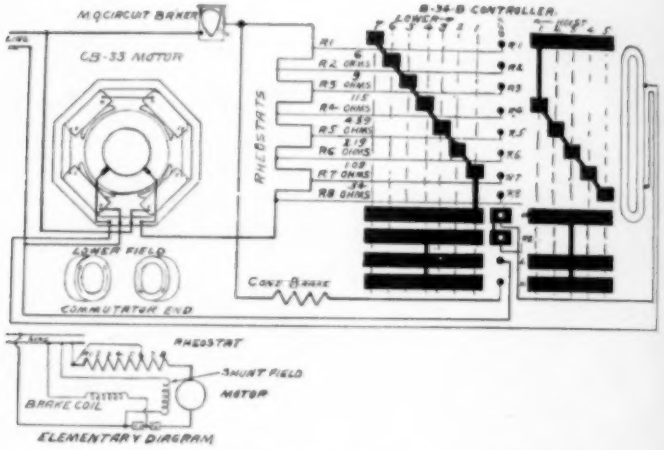


FIG. 154.—Connection diagram of whip hoist controller.

trol being so arranged that when lowering a heavy load the armature will generate current through the resistance, giving an electric brake (Day System). If the load is not heavy enough to overhaul, the armature will take current from the line. In the "off" position the armature is short-circuited, as in previous examples; the fields being separately excited, this produces a powerful braking effect.

The controller is mounted on a cast-iron base within which are mounted the rheostat and circuit breaker, which are accessible throught the water-tight covers to the side openings. The circuit breaker is so connected by a cam and lever that throwing the controller lever to the "off" position will set the circuit breaker.

Formerly there was a foot-brake attachment to hold the load should the current fail, but latest designs combine an electrically-operated cone brake, similar to that used with chain ammunition hoists, or a disc brake, similar to that used for the 12-inch and 8-inch hoists, size reduction being made for difference in the horsepower of the motor.

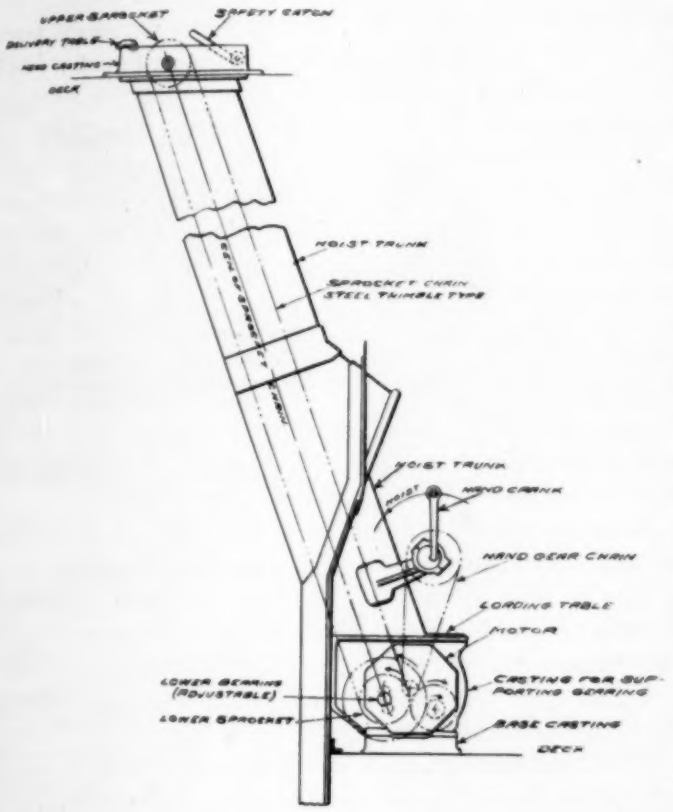


FIG. 155.—Diagram of arrangement of chain ammunition hoist.

Chain Ammunition Hoists.

All ammunition for the intermediate and secondary batteries is supplied by this type of hoist.

The main features of the general system are shown in Fig. 155. Each hoist is enclosed in a water-tight trunk. At the top the

trunk terminates in a composition deck casting fitted with a water-tight cover. There is a hinged delivery table on one side of this casting on which the ammunition is received. To prevent the ammunition from falling back into the trunk a safety catch closes after the passage of each carriage. At the bottom of the trunk is a flanged-plate loading table with the front of the trunk omitted; the space thus formed being blocked out with oak or teak and sheet steel to form a suitable recess for placing ammunition in the hoist. The driving gear is located beneath the loading table and consists of a motor, slip clutch, reduction gearing, and driving sprockets; all mounted on a single cast bed-plate.

The armature shaft of the motor is geared to a counter-shaft, having a pinion on the outer end which engages a gear on a shaft carrying the two lower sprocket wheels. Two continuous chain belts pass over these sprockets, and thence run over two similar sprockets in the deck casting at the delivery end of the hoist. To these two chains carriages are attached at convenient intervals for the size of ammunition boxes that are to be hoisted. The two bearings of the shaft for the lower sprockets can be moved along the arc of a circle, thus permitting adjustment for stretch and wear in the chain. The adjustment is made by adjusting screws which move the bearing as desired.

To prevent overhauling by loads and running the hoist backwards a pawl is fitted at the upper end which permits the carriage to pass up, but will catch and hold it if it starts backwards; in lowering, the pawl can be secured by a pin to allow reverse action of the chain.

A hand gear with sprocket is provided for operating the hoist when the motor is not available.

Some modification of the foregoing arrangement is necessary for especial cases: In one case the motor and operating gear are located on the berth deck while the loading table is in the hold; in another, the motor is on the upper platform, while the loading table is in the hold; the chains pass over two sprockets geared to the motors as usually; each chain is held in place by two idle sprockets, one above and one below the driving sprocket.

The number of carriages used varies from 12 for ammunition for the secondary battery to eight for the intermediate battery.

The motor is shown in Fig. 156, and follows the general line of construction for enclosed, water-tight, armored, shunt-wound, motors of which that for the turrets is the type.

The output is usually 3 horsepower at 125 volts, and having a speed of 400 r. p. m. The motor is 4-pole.

Controlling Panel.—The controlling panel shown in Fig. 157 is a form of starting rheostat generally used with motors having an output of 3 horsepower or greater, as for chain hoists and

FIG. 156.—Motor for chain ammunition hoist.

conveyors. These hoists and conveyors being intended to run at a continuous speed a starting rheostat type is all that is necessary.

The panel consists of a slate base upon which are mounted spring clips for the main line fuses (no-arc, or enclosed, variety); an overload circuit breaker, used as a switch on one leg of the circuit; a single-pole main switch to close the other leg of the circuit; a double-throw, double-pole field switch, for reversing the motor; a starting lever; and starting resistances mounted on the back of the slate.

Attached to the starting lever and shown under the circuit breaker is a no-voltage release magnet.

Two extra terminals are fitted at the top of the panel for connecting in a safety switch, but they are not utilized in ship practice; this is shown in the connection diagram by the connection between the contacts, *S*.

The connections are shown in Fig. 158.

The lever is so arranged that as it is moved forward to the starting blocks connected to the resistance a bell crank and link

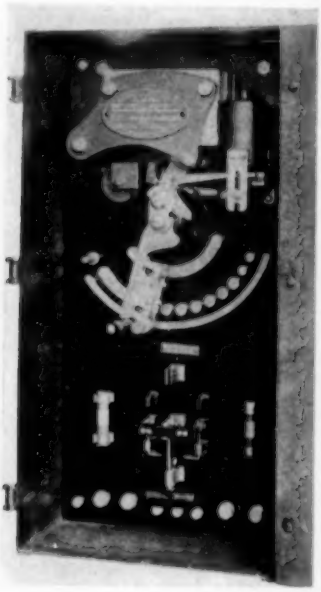


FIG. 157.—Controlling panel, U. S. type, Form C.

closes the circuit breaker, one pole of which is connected through the coil of the overload release magnet to the brass contact *H*. Current from *H* energizes one pole of the field for each throw of the switch. Current also passes from *H* through the lever to the contact *J* of the starting section of the panel and also by the "retaining" contact *K*, of the no-voltage release magnet by means of the push button. In starting, should the lever be moved too fast over the blocks the overload release magnet will attract its armature and trip the catch of the circuit breaker, which is

permitted by the arrangement of the bell crank and link connection to the lever, as the lever reaches the first blocks; that is, the lever closes the circuit breaker to its catch, but on reaching the first blocks no longer operates to keep the circuit breaker closed or interfere with its springing open. The no-voltage release operates in the usual way to release the lever. When the lever springs back against its stop it automatically opens the circuit breaker connection, thus cutting off all line connection to the lever and motor field, the motor field receiving its current through the contact *H*, and the main switch. Since this circuit is closed on closing the circuit breaker, and before the lever reaches the

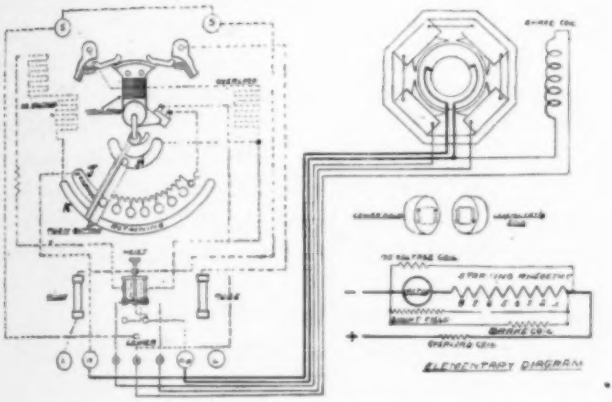


FIG. 158.—Connection diagram of chain ammunition hoist.

blocks of the starting section *the field will be energized before the armature can receive current and will be broken, by the return of the lever, after the armature current has ceased.*

The brake coil is connected to the last armature block and through the binding posts marked *B* one leg connecting to the main switch; this circuit is therefore energized through the resistance to hold the brake released as long as the armature is receiving current, and the brake is set as soon as the lever moves off (to the left) the starting blocks.

The Brake.—The *disc brake*, when used, is a form of that shown in Fig. 150, modified to suit the reduced power of the motor.

The *cone brake* operates on a similar principle to the disc brake of Fig. 150, and is attached to the commutator end of the motor

shaft. The brake consists of two parts: the inner, which is attached to the motor shaft, and which has a machined cone surface; the outer, which contains the brake coil and six releasing springs, and which is attached to the bed of the motor.

The magnet armature plate is of steel and is held from rotating by two pins sliding in slots in the inner casting and keyed to the shaft with a sliding fit. The slide next to the motor is recessed at the center to transfer the friction to the periphery.

The magnet armature is attracted when current passes in the coils releasing contact of the cone with the surface of the armature plate. The cone is of cast brass turned to fit the surface of the inner casting and keyed to the shaft with a sliding fit.

The brake coil is form-wound and insulated with varnished cambric and tape, then wrapped with copper ribbon. It is placed in the recess in the brake magnet and surrounded with type metal.

Each motor is fitted with a mechanical friction overload release clutch on the armature shaft. The clutch is designed to be within the pinion; it is of the double-cone, balanced-clutch type, and set to slip with about 50 per cent overload. The cones are held in place by a coiled steel spring which is adjusted by jam nuts.

Ammunition Conveyors.

Conveyors are practically a horizontal modification of chain-hoist movable platforms which transfer ammunition along an ammunition passage and usually to the chain hoists. There are four on board of the *Connecticut*, two 80 feet long and two 68 feet long; they are designed for a load of about 3000 pounds and operate at a speed of 100 feet per minute when the motor is running at 500 r. p. m.

The movable platform, or apron, is mounted in an especially-designed angle iron framework and consists of a series of stamped galvanized sheet-steel plates, fitted with lugs bolted to the apron sections, which lugs form a sprocket chain. The lugs are fitted with rollers having brass bushings, which operate on the upper part of the angle iron frame. Flat steel strips, riveted to the angle iron guides, limit any transverse motion; roller apron guides are placed at intervals of about 4½ feet to prevent sagging and friction in operation.

The apron is driven by two sprocket wheels, one at each end of a shaft, which mesh in the links of the sprocket chain. This

shaft is direct-connected through a series of gearing with the necessary shafts, bearings, and clutches, to the motor shaft. The sprockets at the loading end are provided with a device for taking up stretch in the chain. The frame is provided with tables at the loading end and opposite the chain hoist; when the loading end table comes into interference with closing or opening a water-tight door, part of the table automatically swings with the door.

The motor is of the same design as that for the chain ammunition hoists (Fig. 156), but has a capacity of 4 horsepower, at 125 volts, and a speed of 500 r. p. m.

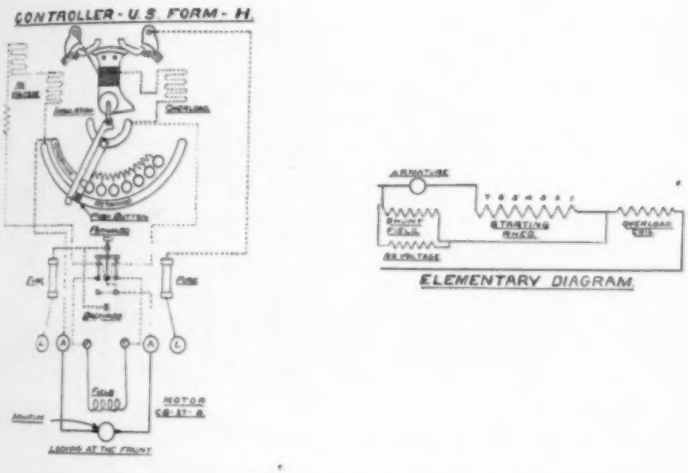


FIG. 159.—Connection diagram of ammunition conveyor.

The controlling panel is identical with that of Fig. 157 in appearance. The connections are shown in Fig. 159, the only difference between them and those of Fig. 158 being a simplification owing to the omission of connections for a magnet brake, as no electrically-operated brake is used in the conveyor management.

A mechanical friction release clutch meshes with the motor pinion and is of a lighter design than that used with chain hoists, but is also of the double-balanced, cone-clutch type, slipping at 50 per cent overload, the clutch pressure being applied by a coiled steel spring set up with jam nuts.

Gun Elevating Motors.

Heretofore a 2½ horsepower series motor has been installed for this service, but a shunt motor of 4 horsepower is now employed, which is fed from a motor generator, upon a simplified arrangement of the Ward-Leonard system. Each gun has its separate motor.

The motor is similar to that used with chain hoists. That for the 12-inch turrets is 4-pole, of 8-horsepower, with a speed of 420 r. p. m.; that for the 8-inch turrets is 2-pole, of 5-horsepower, with a speed of 540 r. p. m.

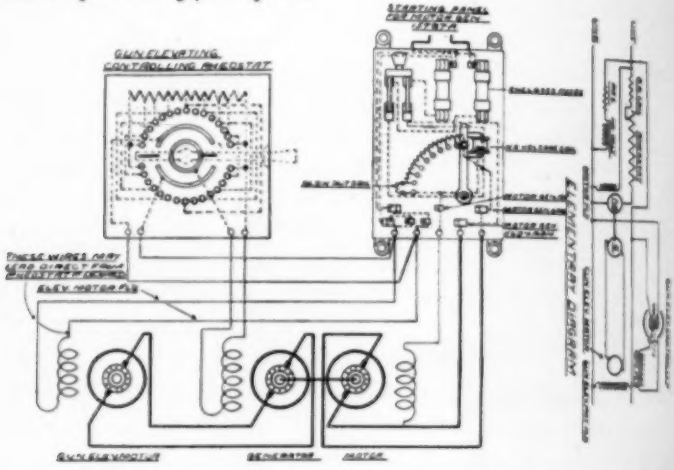


FIG. 160.—Connections of gun elevating controlling panel.

The connections are shown in Fig. 160.

There is no circuit breaker in the elevating motor circuit, the only overload safety device being the overload cut-out on the motor-generator panel.

The controller, or controlling rheostat, is located under the gun-pointer's sighting hood secured to a bracket which is part of the gun-sight bracket. The arrangement of the controller is to control the speed of the motor by the usual process of varying the potential of the generator field; *but reversal is accomplished by reversing the direction of the current in the generator field*, the connections between the elevating motor terminals and the generator terminals remaining fixed and direct.

The arrangement of connections is the same for both 12-inch and 8-inch turrets.

Rammer Motors.

Each 12-inch and 8-inch turret gun is equipped with an electrically-operated rammer.

The motor for the rammer service of the 12-inch guns is 4-pole, of 10-horsepower, speed 1000 r. p. m. It is series-wound and is located on the operating floor of the turret, being connected directly by gears to the rammer mechanism and driving through an overload friction clutch.

The motor for the rammer service of the 8-inch guns is similar to that for the 12-inch guns, and is shown in Fig. 161.

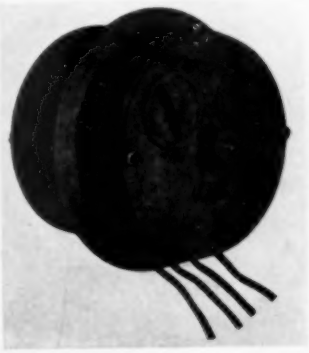


FIG. 161.—Rammer motor. Series wound.

It is 4-pole, having an output of 3½ horsepower, a speed of 750 r. p. m., and is series-wound. The motor is located in the base of the rammer and drives the rammer mechanism by a Morse silent chain.

Controller.—The type of controller used for both types of rammer motors is known as the R-type, its general characteristics being the control of the terminal voltage from the line for the regulation of series motors, both the field and armature current being broken at the "off" position. The type is that familiarly known in trolley service.

The actual apparatus is shown in Fig. 162 of which the lower, larger space is occupied by the rheostats. The apparatus is secured on top of the rammer, the controller cylinder lying horizontally. The lever is designed to be moved in the direction in which the rammer is to move, and the effect is secured by the

connections. The operating lever is so designed that when it is released in any position it will return to the "off" position and be locked in place.

The connections of the controller for the 8-inch rammer motor are shown in Fig. 163.

There are four positions for loading and but two for withdrawing the rammer, the connections for the latter operation providing for all practicable speed.

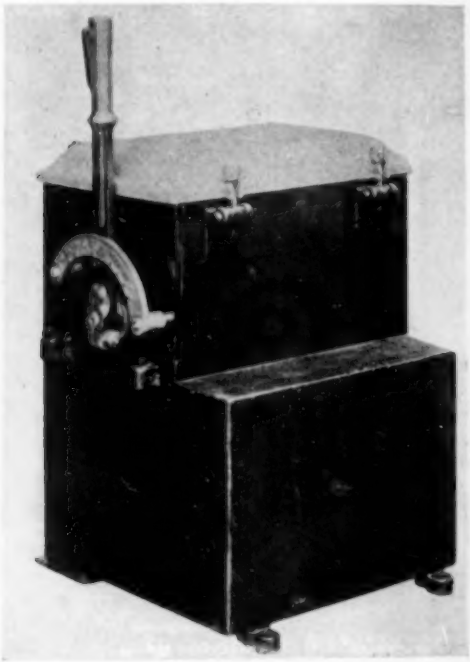


FIG. 162.—Controller for rammer motor.

Boat Crane Motors.

Two boat cranes are installed in latest ship designs, each having a separate motor for hoisting and for rotating. The cranes are designed for a maximum working load of 33,000 pounds, with a fiber stress of 7500 pounds per square inch, and to carry a test load of 66,000 pounds. Each crane has an overhang of 25 feet and a working circle of 300 degrees.

Fig. 164 shows the general arrangement and plan of a crane and the motor locations. The crane is of box section, built up of plate and angles, the weight being carried by a roller thrust bearing at the level of the main deck. There is a pivot steady bearing at the gun deck, and a steady bearing at the upper deck. Surrounding and rotating with the crane is a cast-steel platform on which are located the hoisting and rotating motors, with their accessories, and the hoisting drum. A circular rack is secured to the upper deck and meshes with a pinion of the rotating gear. The hoisting machinery is designed to hoist the working load of 33,000 pounds at a maximum speed of 25 feet per minute, and

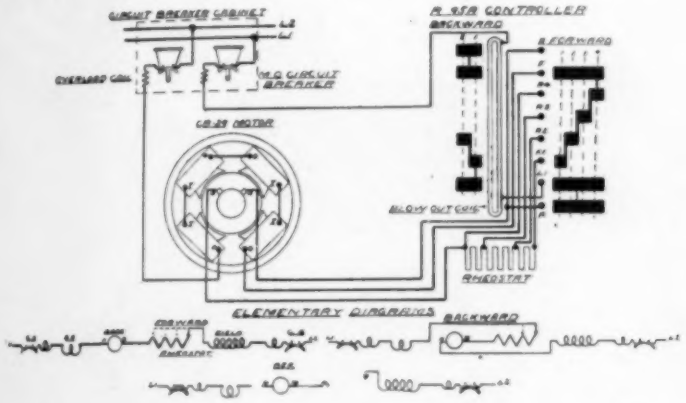


FIG. 163.—Connection diagram of 8-inch rammer controller.

upon removal of this load to hoist the empty hook at a speed of 60 feet per minute. The rotating machinery rotates the crane with the load of 33,000 pounds at a speed of one revolution per minute, the ship being heeled 10 degrees; it must have capacity to rotate while carrying the test load of 66,000 pounds, but at no specified speed.

For hoisting, the motor pinion meshes with the spur gear of the automatic mechanical brake on the end of the worm shaft. A triple-threaded worm engages the worm wheel, which is secured to the hoisting drum. The hoisting rope is a 1-inch (diameter) steel-wire rope leading directly from the drum over a guide sheave on the upper side of the crane structure to the sheaves in the crane head. The cranes have double sheaves with roller bearings.

For rotating, the pinion of the rotating motor meshes with a spur gear on the end of the horizontal worm shaft. The shaft of the worm wheel is vertical, and carries a pinion on the lower end

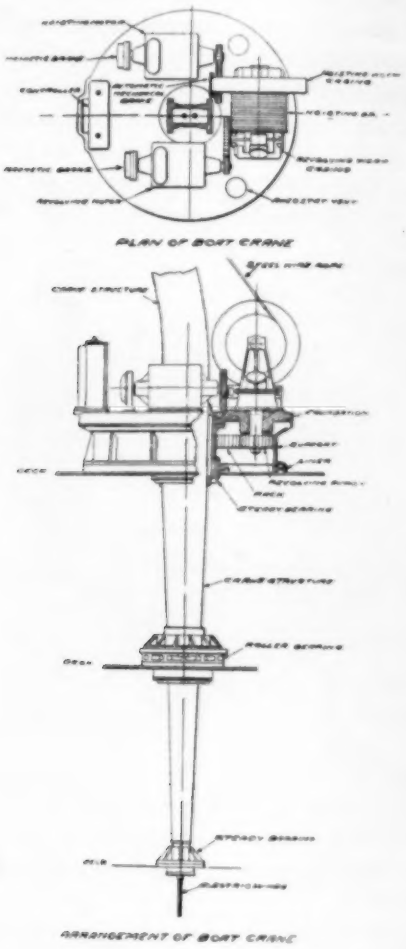


FIG. 164.

which meshes with the circular rack secured to the deck. The worm wheel has an internal mechanical overload disc-friction-release clutch.

The worms for both hoisting and rotating run in oil and have collar-thrust bearings.

The electric brake for both hoisting and rotating motors, is of the disc-type and similar in design to that shown in Fig. 150, the action being the same.

The motor used for the boat-crane service is shown in Fig. 165. It is series-wound, good starting torque for this class of service being important.

The hoisting motor is 4-pole, and has an output of 50 horsepower, a speed of 400 r. p. m., and is of the general iron-clad construction heretofore described.

The rotating motor is similar to the hoisting motor excepting that it has an output of 30 horsepower and a speed of 365 r. p. m.

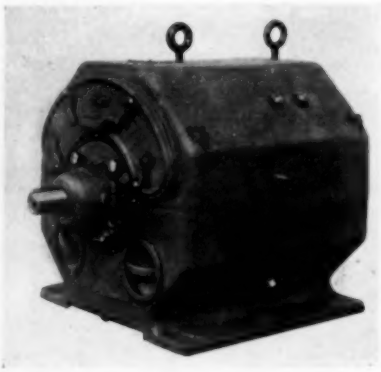


FIG. 165.—Motor for boat cranes.

The controller is shown in Fig. 166. It is of the R-type and made double, combining the controller for the hoisting motor and that for the rotating motor, including the circuit breakers, in one assemblage. The controller is so located on the platform that the operator faces the load.

The connections of the controller to the motors is shown in Fig. 167. While essentially the usual controller method of starting rheostat, with accessories, the ingenious method of interconnection of but a single line supply will be noted; as shown, there are eight positions for both ahead and reversal action for both motors.

Automatic Mechanical Brake.—In addition to the electric brake on the hoisting motor an automatic mechanical brake is fitted on the worm shaft. It is of the disc-friction type, which is

set when any torsional strain, due to a load on the hoisting rope is put on the worm shaft. This is accomplished by a cam which forces the pinion along the axis of the worm shaft and compresses the discs; when the cam returns to its "off" position the discs are returned to their "off" position by the pressure of coil springs. *In hoisting* the brake is set by a rotation of the pinion, which is sufficient to cause the shaft to turn with the pinion, the ratchet being turned away from the pawls, the pawls being held

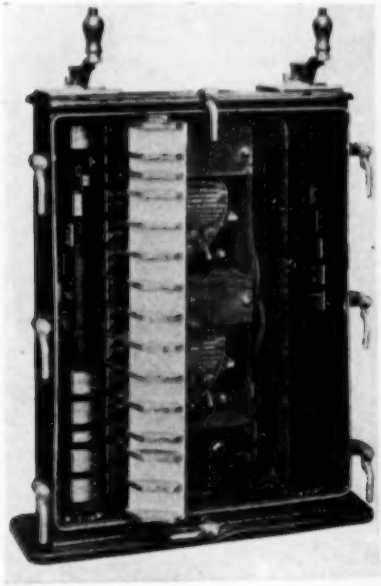


FIG. 166.—Controller for both motors of a boat crane.

off by a friction pin, which rubs on the side of the gear. *In lowering*, with no load on the crane, the friction of the worm, worm wheel, and drum bearings will cause a torque in the opposite direction to that caused in hoisting. The pinion will drive the worm shaft by the shoulder on the cam, the brake being in the released position, and the ratchet driving against the pawls, and, therefore, held by them against rotation; the composition discs are also held from rotating, but there being no lateral pressure there is no braking effect. Should there be a load on the crane, sufficiently to cause the gearing to overhaul or run faster than the

speed of the driving motor, there will be torque in the same direction as that of hoisting, proportionate to the load, and which determines the amount of lateral pressure on the discs. Should the motor be stopped the whole effect of the torque falls to the cam, which produces the necessary lateral pressure to hold the load stationary. The motor having been started again relieves the torsional strain on the cam; the speed of the motor then determines the torsional strain on the brake and, therefore, the descending speed of the crane load.

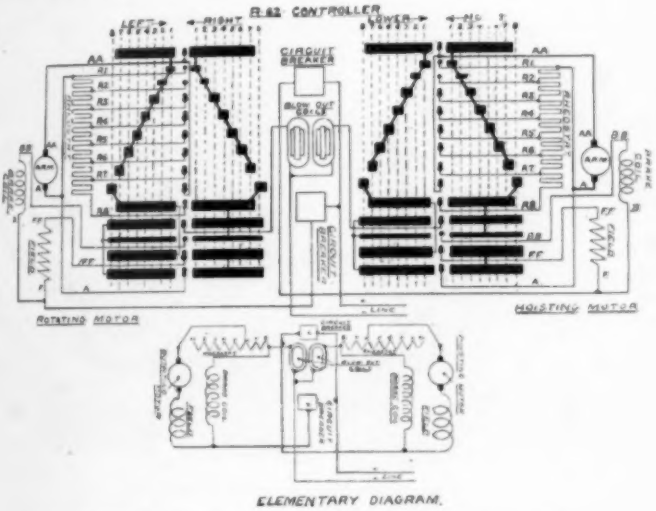


FIG. 167.—Connection diagram of boat crane controller.

Automatic Stop.—This consists of a trigger so installed that when the crane reaches nearly the extreme limit of its travel in either direction of rotation the trigger strikes a stop placed under the operating platform and trips the circuit breaker.

Deck Winch Motors.

For this type of service the series motor is most frequently used, it being usually considered that the electric and mechanical losses of the motor, including the load occasioned by the gears, is sufficient to guard against racing should the fall part or the motor be otherwise deprived of load.

A type in general use is the Superstructure, or Upper Deck

Winch, shown in Fig. 168; there is also a Main Deck Winch type. Fig. 168 does not entirely accord with the latest arrangements of the winch, as noted in this description, but conveys the idea of winch assemblage in general.

Superstructure, or Upper Deck Winches are single-speed, reversible, and capable of exerting a pull of 2200 pounds at a peripheral speed of 300 feet per minute. Upon a cast-iron base are mounted the bearing stands, motor, and controller, the base having sufficient bolt lugs for equal distribution of the strain on the deck. The bearing stands are cast iron, having bronze-bearing linings lubricated by grease. The main shaft is 4¼

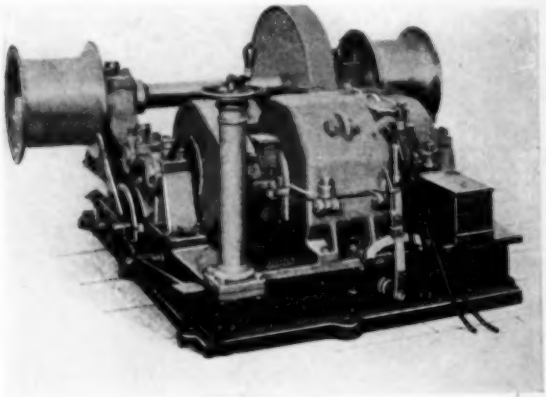


FIG. 168.—Upper deck winch.

inches in diameter, of forged steel; upon it are mounted two gypsy heads, 18 inches by 18 inches, and a band wheel to which the mechanical brake is applied; there is no electric brake. The friction band is a steel strap, lined with wood, having sufficient surface to hold the load when operated by the foot lever mounted on the side of the base. All gears are of cast steel except the motor pinions, which are of wrought steel. The pinion has 14 teeth and the gear 84 teeth, of 3 diametrical pitch and 4-inch face. The gears are enclosed in a cast-iron case which is divided in the horizontal plane. The resistance is contained in a water-tight enclosure, and is provided with a packed, removable cover.

The motor is 4-pole; of the armored, enclosed type of construction; is series-wound, has an output of 25 horsepower, and a speed of 350 r. p. m.

The controller is of the R-type and similar in construction to that for the boat cranes (Fig. 166) except that it is single instead of double.

The connections are shown in Fig. 169.

Main deck winches are reversible and have two speeds, the ratio between the fast and slow speed being 1 to 6. They exert a pull on the gypsy head of 13,200 pounds at a speed of 50 feet per minute, or of 22,000 pounds at 300 feet per minute. There are three bearing stands; two of these are arranged to carry the

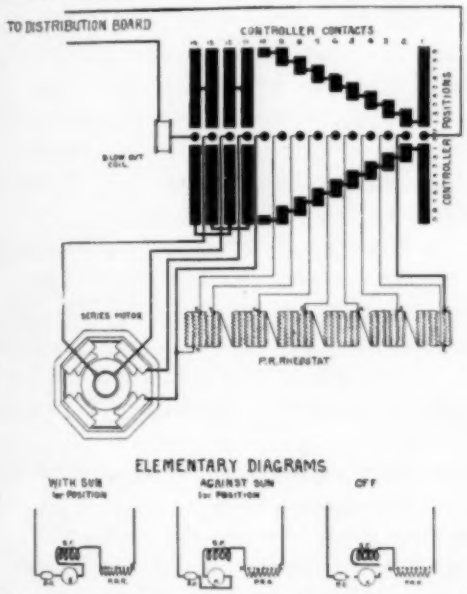


FIG. 169.—Connection diagram of controller for upper deck winch.

bearings of both the main and secondary shafts, this to secure proper alignment. The main shaft is of hammered steel and is 6½ inches in diameter. Upon each end of the main shaft are two gypsy heads, identical with those used in upper deck winches. Two pinions and a clutch are mounted upon the secondary shaft; the clutch is operated by a lever which is provided with spring lock and quadrant to avoid possibility of accident; the clutch is keyed to the shaft; the pinions run free. The change of speed ratio is effected by changing the position of the lever.

The motor, controller, mechanical brake, and foot lever are the same as in upper deck winch assembly.

Ventilation Motors.

Although usually considered as apparatus of larger size and designated as blowers, the general classification includes the portable fan of ¼ horsepower, and the bracket and desk fans, of ⅙ horsepower and 1/12 horsepower.

Blowers.—These include all fans requiring more than ¼ horsepower, the number and large variation in size being indicated in the table on page 336.

The general ventilation of the *Connecticut* is subdivided into 33 independent systems, rendering unnecessary the piercing of any of the principal water-tight bulkheads below the protective deck, reducing the number of automatic bulkhead valves, increasing the efficiency by the use of smaller and shorter lengths of piping, thereby reducing frictional resistance and weight. At 1-ounce pressure this ventilation system is designed to give a change of air as follows:

(*a*) Officers' quarters and crew spaces, berth deck, outside of casemate armor, in about 12 minutes.

(*b*) Officers' quarters and crew spaces, berth deck, within casemate armor, in about 4 minutes.

(*c*) Water-closets and crew's heads, in about 6 minutes.

(*d*) Storerooms in general, magazines and passages, in about 8 minutes.

(*e*) Engine-rooms, general workshop, and steering compartments, in about 2 minutes.

(*f*) Evaporator room, in about 2½ minutes.

(*g*) Air space over boilers, in about 1½ minutes.

(*h*) Dynamo rooms, in about ¾ of a minute.

The 33 systems are designated as sets in the following table, in which each set is designated by a serial number shown on a name plate on the ventilator assemblage installed in the ship. The table also shows some details of the motor as to number of poles, horsepower, range of speed, and whether open or enclosed; also the fan capacity in cubic feet per minute from manufacturers' tests.

The spaces ventilated by the foregoing sets are:

Set. No. 1.—To exhaust from water-closets, etc., on gun-deck forward of bulkhead 17; and from sick bay water-closet, isolation ward, and paint and oil-rooms on berth-deck forward of bulkhead 16.

Sets Nos. 2 and 3.—To exhaust from the forward dynamo-room.

Sets Nos. 4 and 5.—To exhaust from firemen's and servants' wash-rooms, and passages on berth-deck between bulkheads 40½ and 72. The discharge from these fans is used in ventilating the air space over the boiler-rooms.

Set No. 6.—To exhaust from the evaporator-room. The discharge is used for ventilating the air space over the boiler-rooms.

Sets Nos. 7 and 8.—To exhaust from officers' water-closets, etc., on the gun-deck between bulkheads 74 and 78.

Sets Nos. 9 and 10.—To supply fresh air to engine-rooms.

Sets Nos. 11 and 12.—To supply fresh air to junior and ward-room officers' quarters, general workshop, etc., on berth deck between bulkheads 72 and 94.

Set No. 13.—To supply fresh air to sick bay, operating-room, dispensary, band-room, commissary store-room and passages on the berth-deck forward of bulkhead 24; also to torpedo-room and store-rooms below the berth-deck forward of bulkhead 24.

Sets Nos. 14 and 15.—To supply fresh air to magazines and store-rooms below the berth-deck and between bulkheads 24 and 35.

Sets Nos. 16 and 17.—To supply fresh air to compartments on the berth-deck between bulkheads 24 and 40½; also to communication and distribution-rooms in forward dynamo-room.

Sets Nos. 18 and 19.—To supply fresh air to forward dynamo-room.

Sets Nos. 20 and 21.—To supply fresh air to after dynamo-room.

Sets Nos. 22 and 23.—To supply fresh air to magazines and store-rooms below the berth-deck between bulkheads 83 and 94.

Set No. 24.—To supply fresh air to quarters and other compartments on the berth and protective-decks aft of bulkhead 94; also to supply air to bath-rooms on the gun-deck aft of bulkhead 94.

Set No. 25.—To exhaust from steering compartments on upper platform-deck.

Sets Nos. 26, 27, 28, and 29.—To supply fresh air to communication passages between bulkheads 35 and 83.

Set No. 30.—To exhaust from after dynamo-room.

VENTILATION TABLE.

Set No.	Type of Fan.	Motor.		Panel Type U. S. Size.	Capacity of Fan, cubic ft.*	Fan.	Location.		
		Classification.	Kind.			Kind.	Deck.	Frame.	Side.
1	45 S. P.	M. P....4....3.75 H. P..... 730/ 980... 125 V...	Enclosed	No. 1.	3026/ 3895	Exhaust.	Gun	8-9	Amd.
2	4 Mon'g	B. P.....2.....1.1 H. P.....1080/1450....125 V...	Open	No. 1.	876/ 1209	"	Berth	36-37	Port.
3	4 Mon'g	B. P.....2.....1.1 H. P.... 1080/1450 ...125 V...	"	No. 1.	877/ 1181	"	"	36-37	Stbd.
4	6 Mon'g	B. P.....2... .2.7 H. P..... 820/1190....125 V...	Enclosed	No. 1.	1942/ 2610	"	Gun	42-43	"
5	6 Mon'g	B. P.....2.....2.7 H. P..... 820/1190....125 V...	"	No. 1.	1941/ 2594	"	"	58-59	"
6	30 S. P.	B. P.....2 .. 1.65 H. P.....1115/1485 ...125 V...	"	No. 1.	1192/ 1611	"	"	65-66	Port.
7	2 Mon'g	B. P.....2 ... .75 H. P.....1750/2125....125 V...	"	No. 1.	486/ 605	"	"	65-66	Stbd.
8	2 Mon'g	B. P.....2. .. .75 H. P.....1750/2125....125 V...	"	No. 1.	485/ 618	"	"	65-66	Port.
9	80 S. P.	M. P.....4 .....12 H. P..... 430/ 525 ...125 V...	"	No. 3.	10809/13245	Supply.	"	75-76	Stbd.
10	80 S. P.	M. P.....4.....12 H. P..... 430/ 525....125 V...	"	No. 3.	10802/13330	"	"	75-76	Port.
11	55 S P.	M. P.... 4.....5.8 H. P..... 615/ 820 ...125 V...	Open	No. 1.	4648/ 5699	"	"	82-83	Stbd.
12	55 S. P.	M. P.....4.....5.8 H. P..... 615/ 820....125 V...	"	No. 1.	4231/ 5789	"	"	82-83	Port.
13	60 S. P.	M. P.... 4.....7.4 H. P..... 605/ 780....125 V...	"	No. 2.	6401/ 7902	"	Berth	12-13	Stbd.
14	50 S. P.	M. P.....4.....4.6 H. P..... 670/ 990....125 V...	"	No. 1.	3109/ 4606	"	"	34-35	Port.
15	50 S. P.	M. P.....4.....4.6 H. P..... 670/ 990....125 V...	"	No. 1.	3112/ 4528	"	"	34-35	Stbd.

13	60 S. P.....	M. P.... 4.....7.4 H. P.....	605/ 730....	125 V...	"	No. 2.	3109/ 4605	"	"	34-35	Port.
14	50 S. P..	M. P.....4.....4.6 H. P.....	670/ 990....	125 V...	"	No. 1.	3109/ 4605	"	"	34-35	Port.
15	50 S. P.....	M. P.....4.....4.6 H. P.....	670/ 990....	125 V...	"	No. 1.	3112/ 4528	"	"	34-35	Stbd.
16	45 S. P.....	M. P.....4.....3.75 H. P.....	730/ 980....	125 V...	"	No. 1.	3090/ 3802	"	"	36-37	Port.
17	45 S. P.....	M. P.....4.....3.75 H. P.....	730/ 980....	125 V...	"	No. 1.	2684/ 3877	"	"	36-37	Stbd.
18	60 S. P.....	M. P.....4.....6.3 H. P.....	605/ 730.. ..	125 V...	"	No. 2.	5341/ 6539	"	"	37-38	Port.
19	60 S. P.....	M. P.....4 ....6.3 H. P.....	605/ 730....	125 V...	"	No. 2.	5341/ 6608	"	"	37-38	Stbd.
20	60 S. P.....	M. P.....4.....6.3 H. P.....	605/ 730....	125 V...	"	No. 2.	5392/ 6549	"	"	70-71	Port.
21	60 S. P.....	M. P.....4.....6.3 H. P. ...	605/ 730....	125 V...	"	No. 2.	5357/ 6539	"	"	70-71	Stbd.
22	45 S. P.....	M. P.. . 4....3.75 H. P.....	730/ 980....	125 V...	"	No. 1.	2812/ 3883	"	"	82-83	Port.
23	45 S. P.....	M. P.....4....3.75 H. P.....	730/ 980....	125 V...	"	No. 1.	2644/ 3798	"	"	82-83	Stbd.
24	40 S. P.....	B. P.....2 .. .2.6 H. P.....	800/1080....	125 V...	"	No. 2.	2259/ 2839	"	"	110-111	Port.
25	40 S. P.....	B. P.....2 .. .2.6 H. P.....	800/1080....	125 V...	"	No. 2.	2105/ 6385	Exhaust.	"	110-111	Stbd.
26	4 Mon'g	B. P.....2.....1.1 H. P.....1080/1450 ...125 V...			Enclosed	No. 1.	878/ 1185	Supply.	Upper platform.....	45-46	Port.
27	4 Mon'g	B. P.....2.....1.1 H. P.....1080/1450....125 V...			"	No. 1.	877/ 1177	"	" " "	45-46	Stbd.
28	4 Mon'g	B. P.....2.....1.1 H. P.....1080/1450....125 V...			"	No. 1.	893/ 1185	"	" " "	67.5-68	Port.
29	4 Mon'g	B. P. ...2.....1.1 H. P.....1080/1450 ...125 V...			"	No. 1.	883/ 1211	"	" " "	67.5-68	Stbd.
30	35 S. P.....	B. P.....2.....2.2 H. P.....	980/1225....	125 V...	Open.....	No. 1.	1718/ 2110	Exhaust.	Dynamo platform...	71-72	Port.
31	4 Mon'g	B. P.....2.....1.1 H. P.....1080/1450....125 V...			"	No. 1.	877/ 1185	Supply.	Upper platform.....	94-95	Stbd.
32	4 Mon'g	B. P.....2 ....1.1 H. P.....1080/1450 ...125 V...			" ...	No. 1.	877/ 1177	"	" " "	94-95	Port.
33	45 S. P.....	M. P.....4 .. 3.75 H. P.....	730/ 980....	125 V...	"	No. 1.	2816/ 3823	"	" "	99	Port.

* From manufacturers' tests.

Sets Nos. 31 and 32.—To supply fresh air to store-rooms on upper and lower platforms; to torpedo-room, and in hold between bulkheads 94 and 98.

Set No. 33.—To supply fresh air to steering compartments and store-rooms on upper platform aft of bulkhead 98; also to the hold between bulkheads 98 and 101.

There are several blower assemblages installed; the Monogram (B. F. Sturtevant & Co.) fan with General Electric Company's motor; Monogram fan with Sturtevant motor; Monogram fan with Holtzer-Cabot motor; the Steel Plate fan (Sturtevant) with

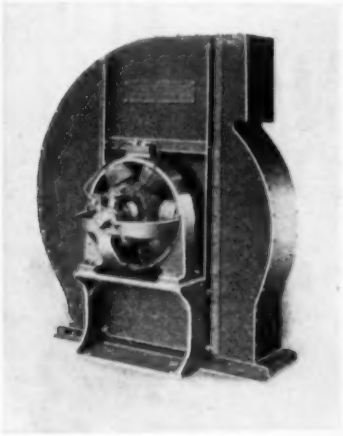


FIG. 170.—50-inch blower assembly.

Holtzer-Cabot motor; and General Electric Company's fan and motor. All have many details in common and of which the 50-inch combination of Steel Plate fan and General Electric Company's motor, as shown in Fig. 170 may be taken as a familiar example.

The steel-plate fans are built up of steel plate and angle bar. The motor is supported by a steel-plate base attached to the fan casing, the motor being insulated from the foundation and fan shell by 3/8-inch fiber saturated in paraffin. The fan wheels are of steel with brass hubs keyed on the shaft, a set screw being provided in the hub.

The motor shown is of the shunt, open-frame, 6-pole, circular-

frame type, but recent types have an enclosed motor, but with an opening at the communtator end for access to the brushes.

The Controller.—The type of starting rheostat used is similar in appearance to that shown in Fig. 157, but as the motors of more than 1 horsepower are to have a varying speed of 20 per cent, a separate lever is provided for changing the resistance in the field circuit. This is shown in the connection diagram of Fig. 171. For varying sizes of motors the No. 1, 2, or 3 size of rheostat panel is provided in accordance with the output of the motor.

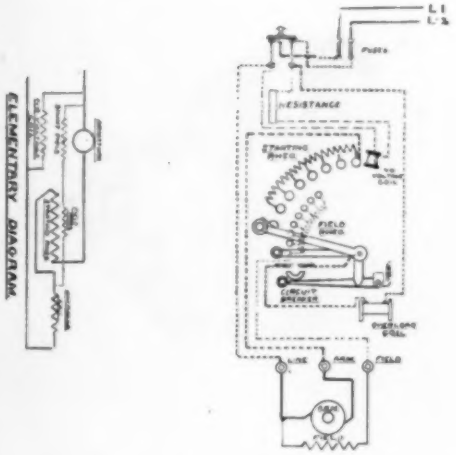


FIG. 171.—Connection diagram of controlling panel for ventilating blowers.

The Monogram type of fan with partially enclosed motor is shown in Fig. 172. This type is more commonly used for exhauster fans or those requiring small power, though there are exceptions in each case.

The type of motor shown is a common commercial type and is frequently made dust proof by covering the openings of the casing with removable doors of brass gauze.

The Portable Fan (¼ Horsepower).

There are several types of this apparatus, often called the portable ventilating set, extant, but a common variety is that shown in Fig. 173; the casing on the commutator end has been removed to show the interior of the motor compartment.

This apparatus is primarily intended for drying out double bottoms, and is supplied with two 25-foot lengths of 4-inch canvas hose which are to be attached to the nozzle. There are six curved fan blades attached by spider legs to a sleeve which is mounted directly on the motor armature shaft. But one long bearing is used, situated between the armature and the sleeve. The motor is on the right-hand side when facing the outlet.

The rated horsepower of the motor is ¼ horsepower, giving a speed of 2200 r. p. m. for a rated input of 3½ amperes at 80

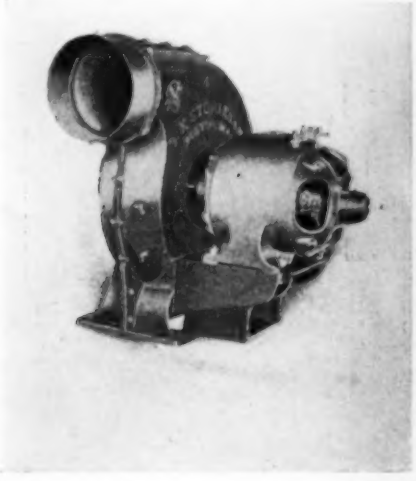


FIG. 172.—Monogram fan.

volts; a variation of speed of 10 per cent above or below 2200 r. p. m. may occur for the rated input.

The minimum cubic feet of air delivered per minute, free exhaust, is 500. The minimum velocity of air in feet per minute, free exhaust, is 4000 if tested by anemometer, or 3500 if tested by water gauge. The latter method is preferable.

The motor is 4-pole, and is series-wound since the load is constant. The field cores are cast in one with the circular motor frame, the coils being slipped on and held by the pole pieces.

Only two brushes, of the pig-tail type, ¾ by ⅜ by 2 inches are used, and are set 90 degrees apart, the armature being cross-connected. No rocker arm is required as the machine runs fully

loaded and no shifting of brushes is necessary after the original adjustment is made.

The journal is lubricated by a sight feed oil cup, which has sufficient capacity for an 8-hour run. After passing over the journal the oil runs down into a receptacle at the bottom and is drawn off through a drip cock.

The motor has no starting rheostat or other method of control.

Bracket and Pedestal Fans.

These fans are of ⅙ horsepower and 1/12 horsepower. But few pedestal fans are now used, the adjustable bracket having taken their place on board ship.

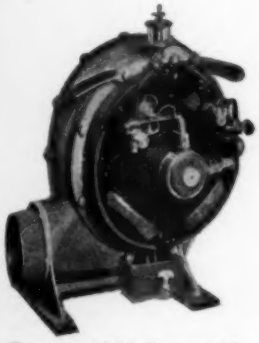


FIG. 173.—¼ H. P. portable ventilating set.

FIG. 174.—Bracket fan, 1/12 H. P.

The ordinary type of bracket fan, 1/12 horsepower, is shown in Fig. 174. The ⅙ horsepower only differs in being larger and having a 16-inch fan instead of the 12-inch for the 1/12 horsepower size.

The general arrangement of the fan construction is shown in the cross-section of a pedestal fan in Fig. 175.

The armature is of the drum type with 12 circular slots in the periphery for the 1/12 horsepower. A narrow groove is cut into each slot, making an opening through which the wire is inserted in winding. The slot being practically closed renders bands unnecessary for resisting the centrifugal force on the conductors, and also reduces the reluctance of the air gap and the magnetizing force required for it to a very low amount, resulting in a

very efficient and economical construction for a machine of this small size.

The special feature of the design is the use and disposition of the single field coil which produces the magnetic field. The construction omitting guard, for the pedestal type, is shown where the armature is shown in full side view and the bearings, field magnet, and spool are in half section.

The poles each encircle about 130 degrees of the periphery of the armature, and are joined to the field magnet at opposite ends

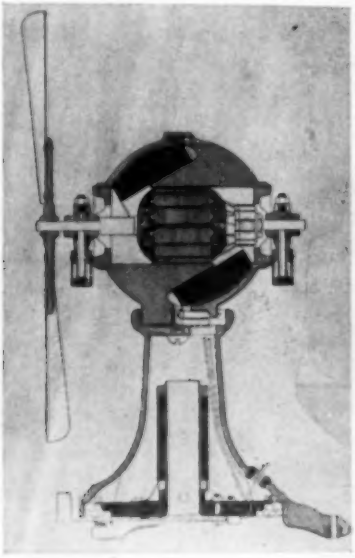


FIG. 175.—Cross-section of pedestal fan.

rather than equally around the center as in the conventional construction. This admits of enclosing the circular field coil between the two halves of the field magnet in the portion shown. The magnetic circuit is but slightly lengthened in the poles in this construction but is compensated for by other desirable features.

Different constructions of the rheostat and regulating switch have been used, the one represented being a metal base on which is mounted a slate block containing the contact buttons and binding posts, and from which the circuits and taps (three) from the resistance wire, which is insulated by enamel from the vertical tube, are led.

The two brushes are of carbon, cylindrical in form, 1¼ inch long by 5/16-inch diameter, for both the 1/12 horsepower size and the ⅙ horsepower size. The oil cups contain a cylinder of felt which lifts the oil to the spindle bearings by capillary attraction. A spring keeps the felt in contact with the shaft and compensates for wear.

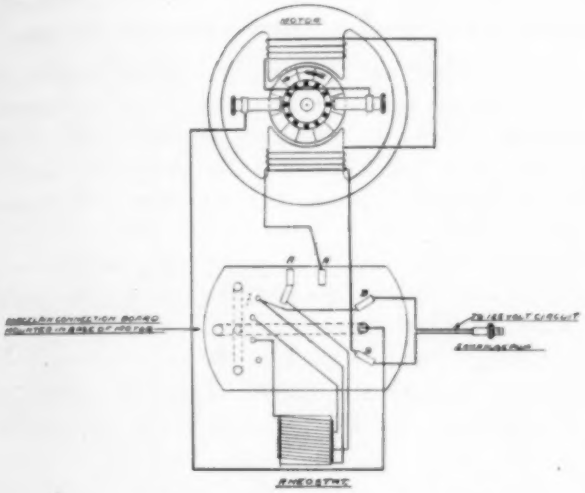


FIG. 176.—Connection diagram of bracket fan.

The latest design for fans of ⅙ and 1/12 horsepower are arranged to be converted into either a pedestal or bracket fan at will; they are further designed to be used on either a 125-volt or 80-volt circuit by merely changing the connections as shown in Fig. 176, for the 125-volt circuit connections are made to *BB*, as shown; if to be used on an 80-volt circuit connections are made to *AA*.

CHAPTER IX.

MISCELLANEOUS MOTOR APPLICATIONS.

Motors for Operating Power Doors and Hatches.

The electrical drive for the long-arm system installed in the *Florida* contemplates only the operation of the air compressor; the doors are operated by pneumatic pressure acting on one or the other side of a piston which slides in a barrel attached to the door, the operating pressure being about 500 pounds per square inch.

On board the *Connecticut* each power door and hatch is operated by its separate motor; the system comprises two emergency stations located on the forward bridge, and 23 vertical and 19 horizontal sliding doors, as well as five protective-deck hatches. Two emergency stations are utilized because the capacity of one station is insufficient for the operation of the total number installed.

Power Doors.

The two types of *door*, horizontal and vertical, are shown in Fig. 177, *A* and *B*. Each door is supplied with two removable hand wheels that the device may be operated by hand in case of failure of the electrical supply to the motor; the hand wheels are stowed in the immediate vicinity of the door. The wedges are drop-forged of bronze; each wedge works on a hard brass roller mounted on a bronze pin, this arrangement preventing any refusal in closing due to foreign objects or coal about the wedges. It also operates to prevent an unreasonable escape of water for which specifications require not more than 10 gallons per minute under a head of 35 feet, and not more than 2½ gallons per minute under a head of 20 feet. The door plate is driven from the motor or hand wheel by a system of gearing, and in each type a worm is introduced which will cause the thrust on the door plate to bear a direct ratio to the end thrust exerted by the worm. The end thrust is resisted by a helical spring, which is subjected to an initial compression sufficient to effect water-tight closure with-

out further load on the spring. If the thrust on the door plate in closing or opening exceeds this initial compression the spring yields and operates the limit switch in the controller, the limit switch acting to cut off the electrical supply to the motor. In the case of the vertical sliding door, the worm acts directly on the worm rack on the door plate; the end of the worm is cut off squarely to sweep out any coal lodging in the rack. In the case of the horizontal sliding door, the driving is accomplished by two

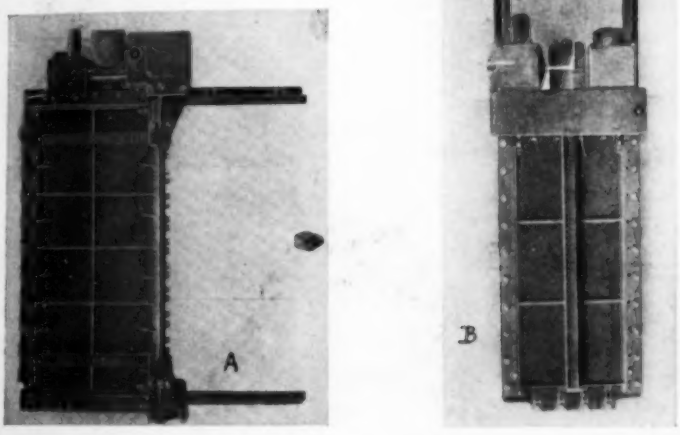
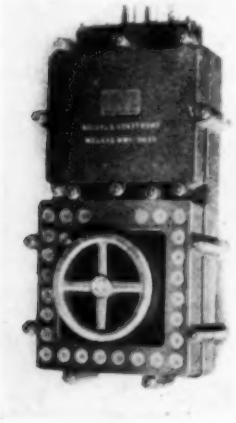


FIG. 177.—Horizontal and vertical water-tight doors (closed).

racks meshing with spur pinions. The rack teeth being vertical free themselves of foreign matter which might lodge.

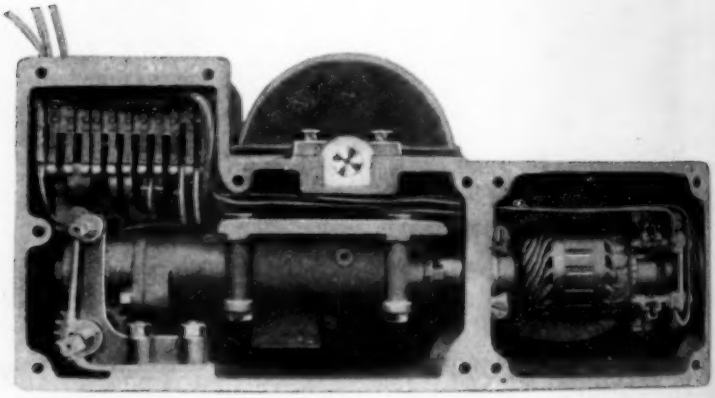
The working parts of the *emergency station* are contained in a water-tight brass case mounted on the wall of the pilot-house or at any other convenient place running to the bridge. The device is shown at *A*, Fig. 178. The apparatus has three parts: first, *the mechanism for controlling the circuits running to each door or hatch;* second, *the lamps to indicate the closure of each door or hatch.* A sketch of the connections for these functions is

shown in Fig. 179. Third, *the fuse box.* The hand wheel is grasped at the hub and pulled away from the cover until the lug on the hand wheel clears the notch on the cover. The wheel is then turned to the right—with the sun—until the lug passes over



A.—Emergency station.

B.—Motor.



C.—Power box.

FIG. 178.

the notch projection. The hand wheel is then let go and the device, by releasing a large spring and controlled by an escapement will close all solenoid circuits at about 3 seconds interval. The gearing does not start all circuits at the same instant—as the

current demanded in such a case would be excessive—and seldom more than four motors are in operation at the same time. The entire closure of 25 doors and hatch gear operated by one station should be accomplished in about 75 seconds. As each door is locked, a circuit running to the emergency station box is closed and lights a small incandescent lamp over each lamp; forming part of the case is a small translucent disc bearing the number of the corresponding door; by pressing a button the operator can assure himself of the closure of all doors; if any lamp fails to glow, that door is not closed. Though each door and hatch can

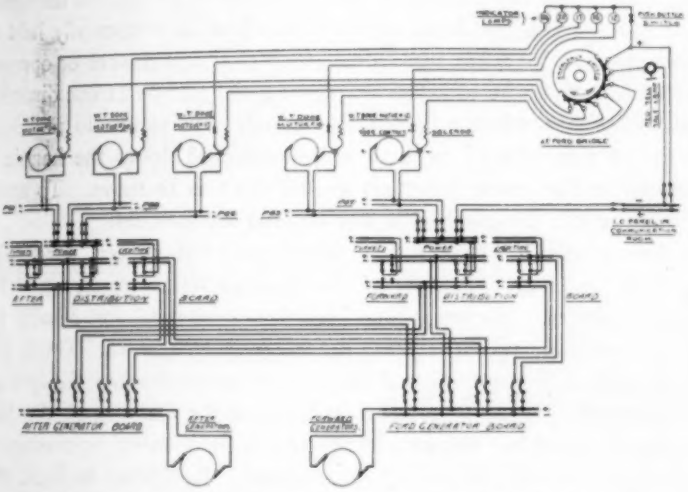


FIG. 179.—Scheme of wiring for doors and hatches.

be locally opened by the controller handle (later described), *as long as the emergency is turned to ON the door will reclose automatically as soon as the local controller handle is released.* In turning OFF the emergency: The hand wheel is turned to the left—against the sun—until the lug on the wheel strikes the notch projection; the wheel is then pulled away from the case and turned to the left until the lug is opposite the notch; letting go the wheel will now permit the lug to enter the notch on the case. Before taking off the cover of this device the current for the entire system should be turned off at the switchboard. In order that the operator may be sure that current is on, as soon as the first solenoid circuit is closed the red lamp under the red disc will

glow and will continue to glow until the circuit is broken by the emergency at OFF.

The motor (Fig. 178, *B*) is direct-current, reversible, compound-wound, iron-clad, bi-polar. It is entirely enclosed within a water-tight case and capable of a normal output of 1 horse-power at 125 volts, with a speed of 1200 r. p. m.; it is also capable of carrying 50 per cent overload for 5 minutes, and four times its rated input for 10 seconds.

The controller and motor, enclosed in a **power box** are shown in Fig. 178, *C*. In the operation of the controller, by means of the handle on the controller and the handle located on the opposite side of the bulkhead or deck, the handle is normally held in mid-position by a spring, from which position closure or opening of the door can be effected by moving the handle in one direction or the other; when released the handle will return to mid-position; in the case of vertical and horizontal doors the handle is moved in the same direction as the door is to move. To avoid complication, the method is not applied for hatches.

The controller device has three essential parts: First, *The switch for local operation of the door or hatch by means of the local handles.* Second, *The emergency switch, for closing the door or hatch, operated from the emergency station.* Third, *The limit switch for cutting off the motor current when the load on the operating parts exceeds a predetermined limit, e. g.,* the door or hatch reaching the end of its travel in opening or closing, or encountering an unyielding obstruction. Referring to Figs. 180, 181, and 185, the switch for local operation consists of five segments, *A, B, C, D,* and *E,* insulated from and rigidly secured to the drum shaft on the end toward the operating handle *F*. These five segments engage seven fingers as shown. The drum shaft *G* is driven from the handle shaft *H* by means of miter gears *I*. The segments of the emergency switch *K* also form part of the circuits for operating the controller by the handle; this emergency switch *K*, shown in Figs. 180, 181, 182, and 185, is assembled on the drum shaft next to the switch for local operation and rocks freely on that shaft. It is held in normal position (Fig. 182) by a spring *L*, and is moved down, so that its two insulated contacts engage the fingers, by the rising of the solenoid plunger *M* when attraction results from a current in the solenoid winding. The same movement of the emergency switch occurs by the switch *K*

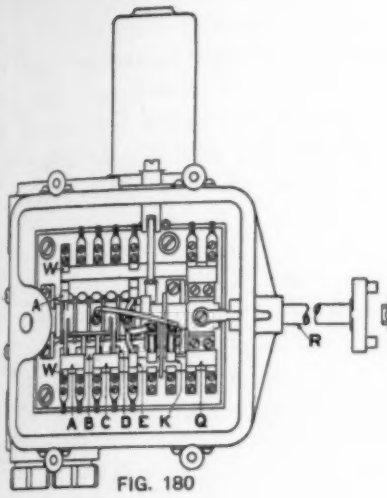


FIG. 180

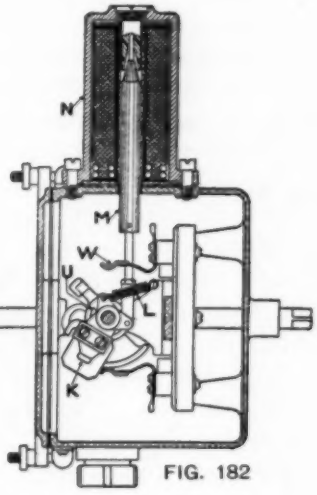


FIG. 182

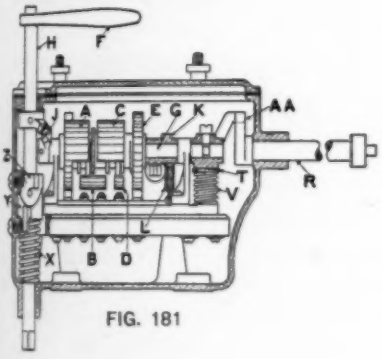


FIG. 181

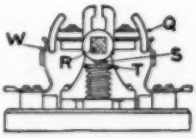


FIG. 184 LIMIT SWITCH
SWITCH IN CENTRAL POSITION

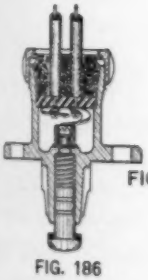


FIG. 186

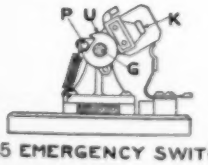


FIG. 185 EMERGENCY SWITCH

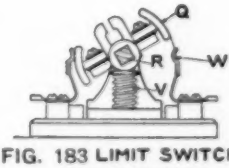


FIG. 183 LIMIT SWITCH
SWITCH THROWN

engaging, through a pin *P*, the side of the slot on the collar *U* of the drum shaft *G;* hence, in closing the door, either by hand or through the emergency station, the circuit is completed through the emergency switch *K*. It will be noted that the operation of the emergency switch by the solenoid does not interfere with operating the door or hatch by the local controller handles, and that as soon as the local handle is released the emergency is again brought into action to close the door or hatch.

The limit switch *Q*, shown in Figs. 180, 182, and 184, is assembled on the end of the drum shaft *G* and rocks freely about the shaft. Its insulated contacts engage four fingers, as shown; this device is operated by the helical spring before mentioned. When the door or hatch has either opened or closed with sufficient force to compress the helical cut-out spring the spindle *R*, entering the controller, rotates through 30 degrees in one direction or the other, moving the limit switch with it. If, for instance, the motion of the limit switch opened the contact between the upper insulated segment and its two fingers the circuit to the motor is broken and the motor will stop. The connection between the lower insulated contact and its two fingers will not, however, be broken by this action, and the circuit, *for operating the motor to open the door,* being closed by this contact will not be broken; if the limit switch had been moved in the opposite direction to that just explained, the circuit through the upper contact would remain closed, tending to close the door or hatch. The particular way in which the limit switch moves on closing the door or hatch depends upon the mechanical connection between the helical cut-out spring and the limit switch; this is somewhat different in the various devices, in some the upper contacts open when closing the door or hatch, in others the lower contacts open for the same purpose.

The **contact box** is to provide means of closing the circuit to the indicator lamp at the emergency station when the door or hatch has reached its closed position. The standard form of the box is shown in Fig. 186. It is a spring switch operated by a plunger which engages a wedge carried by the door plate in power doors; in the case of hatch gears the plunger is acted on by a lug carried by a collar on the crank shaft of the hatch lift. In case the indicator lamp fails to glow when the door or hatch is closed the difficulty can frequently be located in this box.

Power Hatches.

The electrical features for the hatch are the same as for the door but the mechanical details are distinct; an installation for the link-connected lever is shown in Fig. 187.

Referring to Figs. 188 and 189 the hatch plate is raised and lowered by bent levers *A*, which are secured to the fulcrum shaft *B*, and rock with it. This fulcrum shaft is in turn driven from the hatch lift crank by either a link connection, shown in Figs.

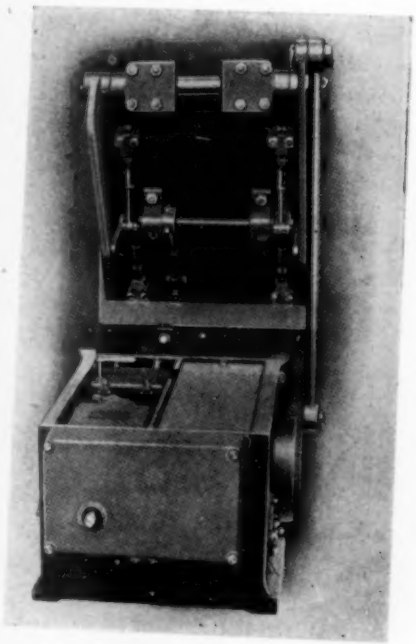


FIG. 187.—Hatch gear. View looking up beneath the protective deck showing hatch plate partly open.

188 to 192, or by a slot and roller. The connection between the bent lever and the hatch plate is through links *C*, connected to the cranks *D* on the locking shaft *E*. The hatch plate in locked position is shown in Figs. 188, 189, and 190. When the bent levers move up the shaft *E* is rotated until *D* touches *F*; no further rotation of *E* then occurs and *F* is in the position of Fig. 191; this slight rotation withdraws the roller bars *G* and unlocks the hatch. In closing the action is reversed. The object of the

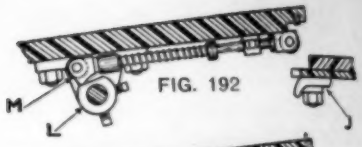


FIG. 192

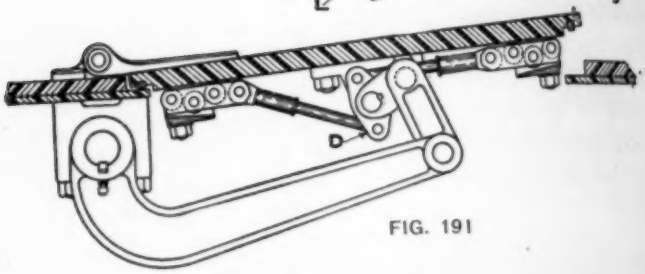


FIG. 191

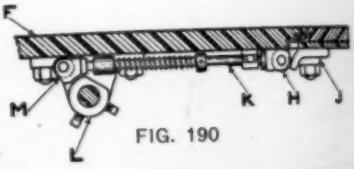


FIG. 190

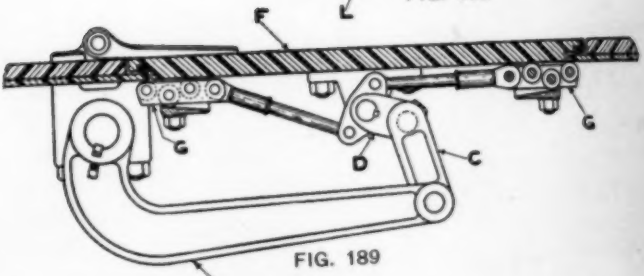


FIG. 189

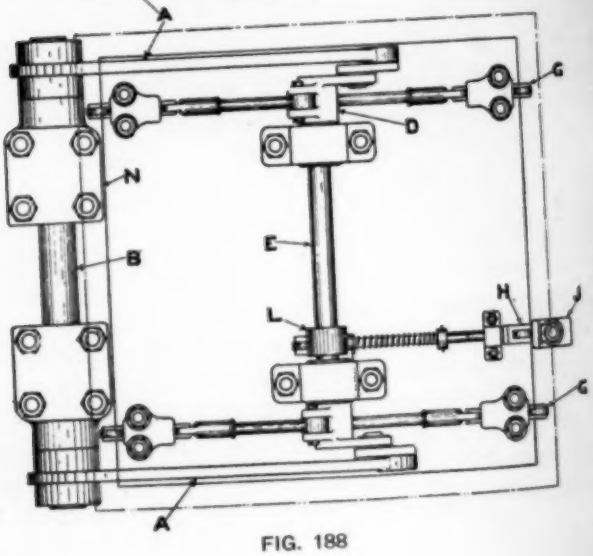


FIG. 188

roller *H*, which engages the stop *J* is to prevent *E* from rotating and this is accomplished by moving *K* away under the action of its spring. The shaft *B* is operated by the rod shown at the side in Fig. 187, which, acting from the worm shaft to a bell-crank-shaped end of the bent lever *A*, if for the slot and roller type (Fig. 187), or the crank of the worm shaft moves in a guide attached to the bent lever if of the link type (Figs. 188 and 189). The limit switch spring is practically the same as for doors.

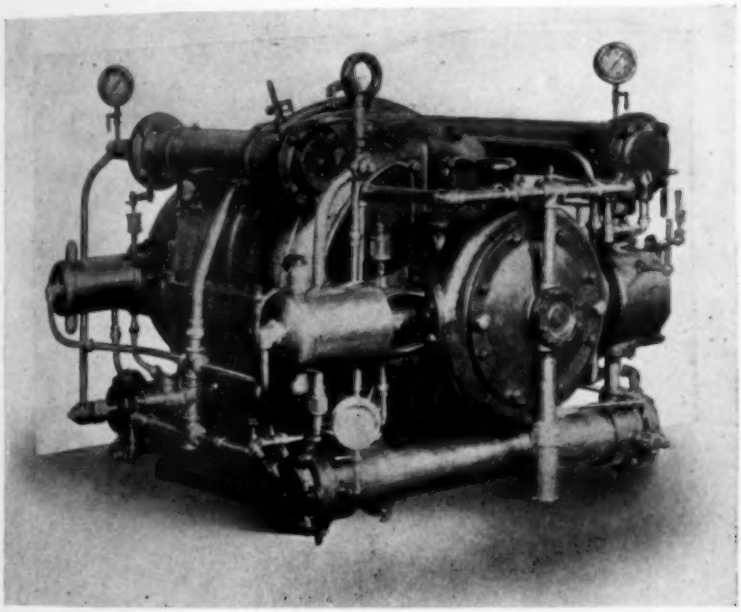


FIG. 193.—Torpedo air compressor assembly.

Torpedo Air Compressor Motors.

The Platt Iron Works assemblage of this large apparatus is shown in Fig. 193. The dimensions in inches are 87 by 61 by 59 high, with a weight of 9000 pounds. The compressor delivers 30 cubic feet minimum of air per hour at 2500 pounds pressure per square inch, with volumetric efficiency of at least 90 per cent and not less than 80 per cent efficiency. A by-pass is fitted to start against full 2500-pound pressure. Pressure gauges for second and intermediate stages of compression are provided; also, sight-feed lubricators on the air cylinder of each stage and separators

on the cooling coils of the first inter-cooler and the after-cooler. A self-contained pump maintains the circulation but can be cut out for gravity circulation under a head of 10 feet. The water-cooling system is provided with a safety valve to blow off at 10 pounds pressure. The motor is 6-pole, shunt-wound, and develops 80 horsepower, at 125 volts supply, and is capable of 25 per cent overload for one-half an hour and a momentary overload of 50 per cent.

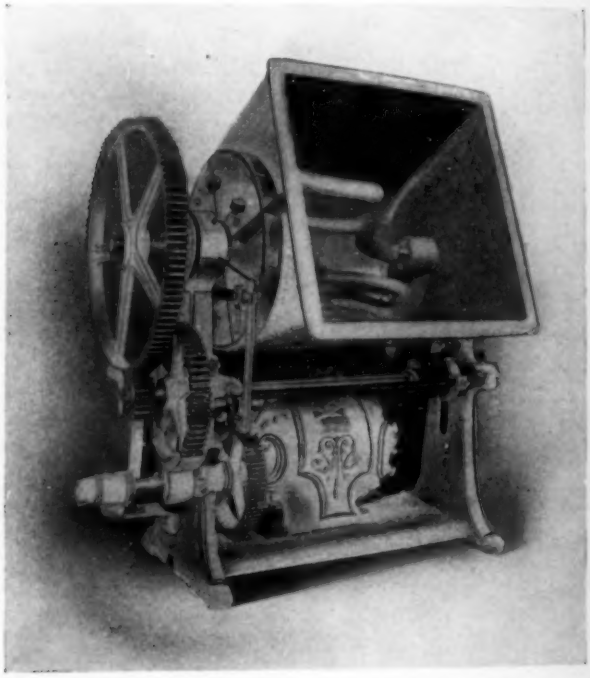


FIG. 194.—Dough mixer assembly.

The starting panel is similar to that shown in Fig. 157, no control of speed being required.

Dough Mixer Motor.

The Day apparatus is shown in Fig. 194. The capacity is one barrel of flour.

The motor is of the 4-pole, shunt type and develops, at 125 volts, 3 horsepower if open, and 2½ horsepower if enclosed. Its

shaft operates through a train of gears a pair of specially-shaped arms, or beaters, which knead the dough by their revolution. There is a separate shaft through which the dough box can be turned on a trunnion axis to facilitate removal of the dough, this action being controlled by a hand lever. The controlling panel is either of the type shown in Fig. 157, or is a slate block at whose top are the line connections through enclosed fuses and a double-

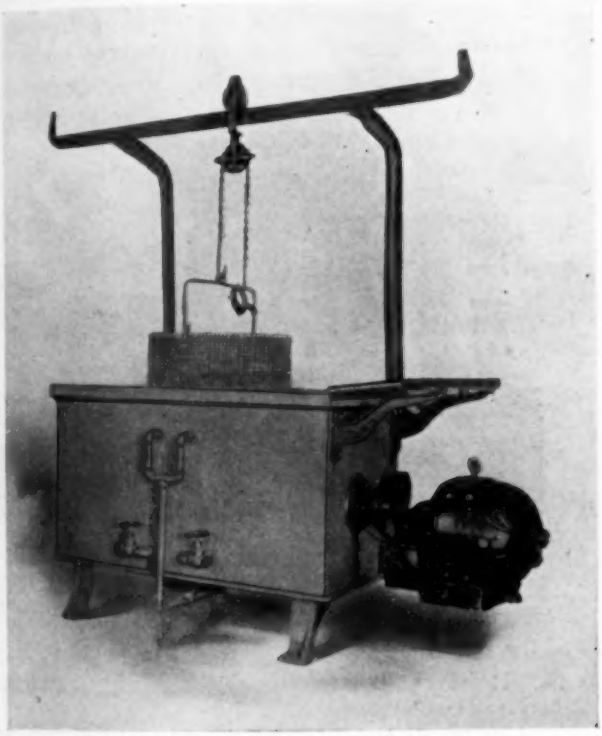


FIG. 195.—Dish washer assembly.

pole switch; at the bottom is mounted a starting rheostat similar to that shown in Fig. 136, and with the same general connections.

Dishwasher Motor.

The Insinger apparatus is shown in Fig. 195. The dishes and cutlery to be washed are placed in the basket shown and lowered

into the water bath containing water, soap powder, or soapine, and lye, but not sufficient alkali to form suds. Solid matter is first wiped off the mess gear with bread. There are two compartments called *the washer* and *the rinser*. In the *washer* compartment the temperature of the water is kept to that which can be borne by the hand; two three-bladed propellers agitate the water in this compartment, the alkali removing the grease, which last can be drawn off by the overflow. The water in the *rinser* compartment is kept at the boiling point and holds clean pure water; the basket is merely dipped two or three times in this compartment. Heating the water is done by steam connections.

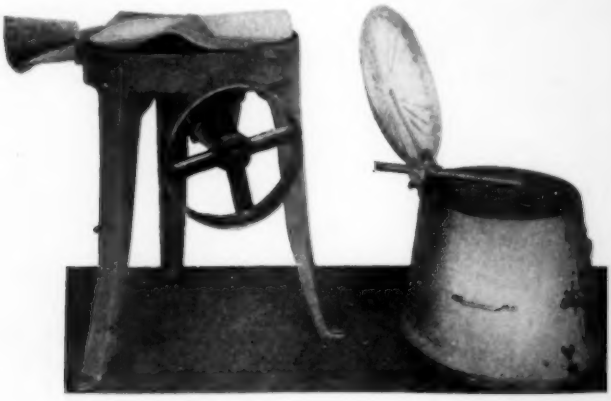


FIG. 196.—Parts of Potato Peeler.

The motor is of ¾ to 1 horsepower, at 125 volts, with a speed of drive of the machine of 310 r. p. m., but must not be less than 300 r. p. m. It drives the propeller shafts through sprockets and gears. The starting rheostat is a Leonard panel form of the type shown in Fig. 136, in which the circuit connections are placed at the top of the panel through enclosed fuses.

Potato-Peeler Motors.

The potato-peeling machine is shown dis-assembled in Fig. 196. The fluted, rotating base of the hopper is revolved by gears on a shaft whose pulley is belt connected to the pulley on the motor shaft, the motor being secured to the deck overhead. The barrel mounts over the rotating parts with its door opposite the trough

shown; the hopper is closed by an open-work cover, whose office is to prevent the potatoes from pushing over the top of the barrel. A steady stream of water flows in at the top of the hopper and out at the base. The top of the fluted rotating base and the inside surface of the hopper have a cut surface similar to that of a file, and, as the potatoes are raised and mixed by the fluted rotating base, they are forced against the side of the hopper, the peel being rubbed off rather than cut and carried away by the water supply. The motor is of the partly enclosed type and develops 1 horse-power at a speed of 1425 r. p. m. It is mounted on a block which is secured to the deck above, a small starting rheostat of panel construction being used in starting. In the last type of rheostat

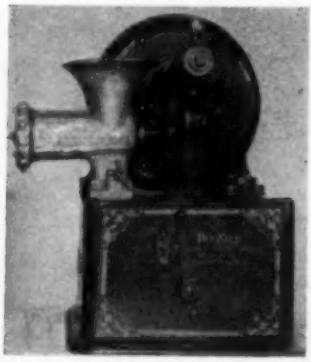


FIG. 197.—Meat chopper assembly.

a wheel lever is introduced for changing the intensity of the motor field and hence the speed. A no-voltage release is provided; the enclosed fuses are relied on for overload.

Meat-Chopper Motor.

This combination is shown in Fig. 197, and is a direct motor connection to the familiar type of sausage-grinder.

The motor is bi-polar, shunt-wound, developing ¾ to 1 horse-power. A simple starting rheostat is provided but a slow and fast speed are contemplated by a knife switch which introduces a resistance in series with the field, and hence higher speed, when the switch is open, and slows the motor by short-circuiting this resistance when the switch is closed, its normal position.

Pump Motors.

The pump apparatus on electrical drive are fresh-water pumps —usually two— and sanitary, or flushing pumps—also two as a rule.

Fresh-Water Pumps.—Both are similar in design and interchangeable. The pump is of the reciprocating type, being three 4 by 4-inch cylinders which are driven by eccentrics on the pump

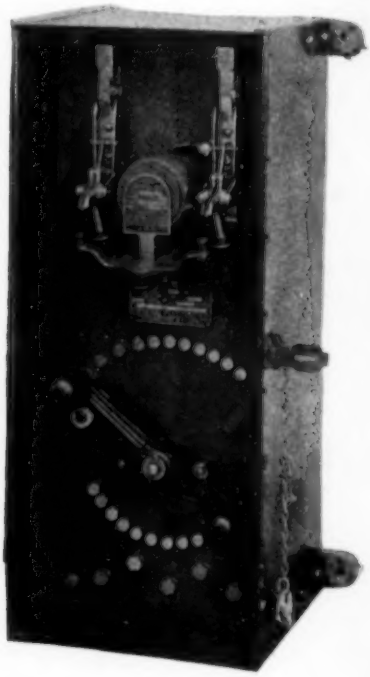


FIG. 198.—Type C. R. controlling panel.

shaft. The shaft is fitted with a large fly-wheel. The drive from the motor shaft is effected through a pinion having 18 teeth and a larger gear having 180 teeth; the motor speed is 1000 r. p. m., and that of the pump 100, delivering 65¼ gallons per minute at full motor load.

The motor is shunt-wound, bi-polar, and develops 2 horsepower.

The controlling panel is a type designed for starting motors of less than 3 horsepower, and combining a blow-out coil; it is shown in Fig. 198. The connections are shown in Fig. 199.

Flushing Pumps.—The two pumps are identical and interchangeable. They are of the horizontal, centrifugal type, and direct connected to the motor drive. They deliver 150 gallons per minute at the motor full-load speed at 35-foot head.

The motor is 3-horsepower, 4-pole, shunt-wound, having a speed of 1080 r. p. m.; and is of the partly enclosed type of construction. A controlling panel similar to Fig. 157 is used for starting.

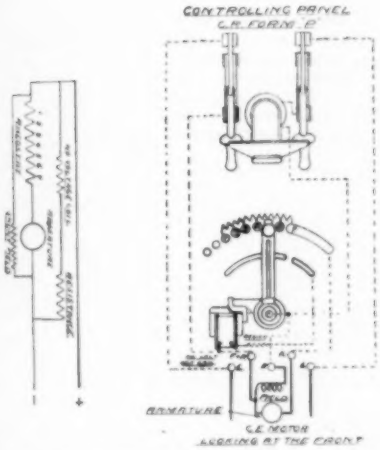


FIG. 199.—Connection diagram. Type C. R. controlling panel.

Laundry Machine Motor.

The laundry machinery consists of one 32 by 54-inch washing machine; one extractor, 20-inch; one No. 9 ironer, and one mangle; all of these are driven by belt from one counter-shaft belted to the main shaft.

The motor is 8-horsepower, 4-pole, shunt-wound, and has a speed of 800 r. p. m. It is of the partly enclosed, dust-proof type and secured to the deck; the motor drives the main shaft by belt and pulley.

The controlling device is similar to that used for chain ammunition hoists (Fig. 157), but has no separate field switch.

Motors for Power Tools.

The following are the kinds and types in latest battleships:

Gap Lathe, 28-Inch by 48-Inch.

The Harrington type of lathe is driven by gearing, variable speed being afforded by field control.

The motor is 4-pole, shunt-wound, and develops 7½ horsepower; the rated speed is from 740 to 1675 r. p. m.

An especial type of controller is used somewhat similar in construction to that shown in Fig. 203, except that the controller is reversible, and the contact fingers are all in one plane. The con-

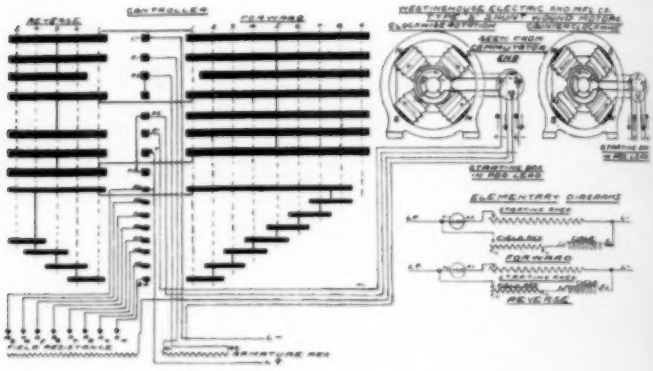


FIG. 200.—Connection diagram 28-inch lathe.

nections are shown in Fig. 200. The controller has one starting-notch through resistance in series with the armature; the armature having attained its normal speed higher speeds are accomplished by moving the controller handle over the remaining eight notches for "Forward," or four notches for "Reverse," in accordance with speed desired. A shipper bar extends over the length of the lathe enabling the machinist to handle the controller from any position of the carriage.

16-Inch Shaper.

This tool is driven by the motor through gearing.

The motor is 4-pole, shunt-wound, and develops 5 horsepower, at a speed of 400 to 1200 r. p. m.

The controlling panel whose connections are shown in Fig. 201 is of the Cutter-Hammer manufacture, type B. Starter

arrangement is made in the connections for variation of speed by field control.

Universal Milling Machine.

The general arrangement for motor drive is the same as for the shaper, except that the drive is by belt.

The motor is 4-pole and develops 2 horsepower, at a speed of 800 to 16,000 r. p. m.

The controlling panel is the same in general details as that used with the shaper motor.

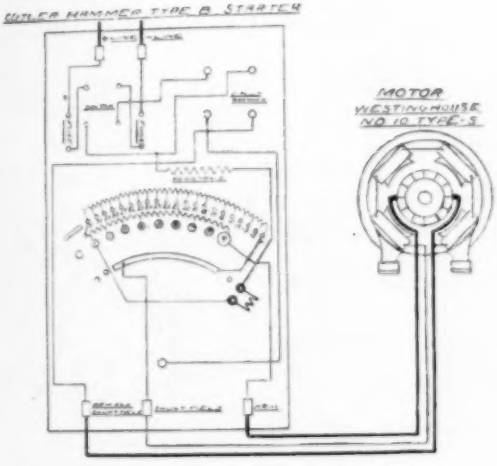


FIG. 201.—Connection diagram 16-inch shaper.

Emery Grinder.

This assembly consists of a 12 by 2-inch emery wheel on each end of the motor shaft, the motor being supported by a column.

The motor is bi-polar, shunt-wound, and developes 2 horsepower, at a speed of 1800 r. p. m., there being a speed variation down to 900 r. p. m.

The method of field regulation to vary the speed is on the Stow system. This system provides a hollow field core for the motor, in which works a plunger, the plunger being driven in or out by gearing. The field effect is, therefore, produced by the change of flux in the armature due to a reduced number of lines of force; that is, the armature flux is practically throttled.

A simple starting rheostat is connected to the motor.

Drill Press, 22½-Inch.

This tool is driven by the motor through gearing.

The motor for the Willey tool develops 1 horsepower, and is 4-pole, shunt-wound.

There is only a simply starting rheostat, the variations in speed of the drill press being effected through belt and cones.

Lathe, 14-Inch.

The drive is effected by gearing to the lathe.

The motor develops 1 horsepower, is 4-pole, shunt-wound, and has a variable speed under field control from 500 to 1500 r. p. m.

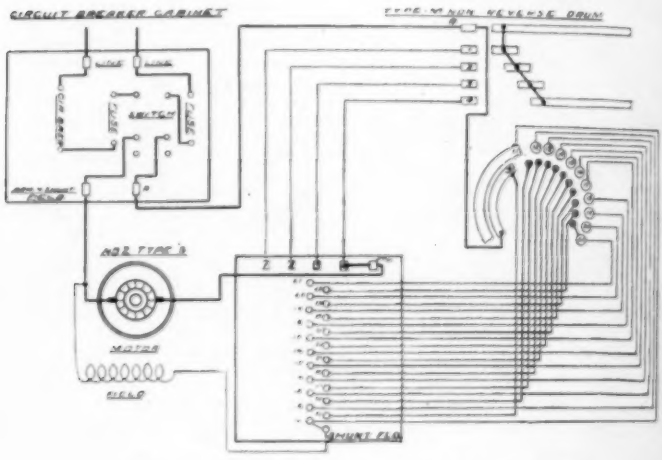


FIG. 202.—Connection diagram, 14-inch lathe.

The connections of the controller are shown in Fig. 202. The non-reverse drum (Fig. 203) is in effect a type of controller for uni-directional rotation of the motor; the lower contact arc regulates the field as, after the armature acceleration is completed, a farther motion of the drum spindle will cut resistance into the field circuit on the several points, thereby gradually accelerating the motor speed, or driving the motor at the desired working speed.

Sensitive Drill Press.—This small tool is driven directly by the motor, which is mounted on top of the drill shaft.

The motor is shunt-wound, bi-polar, developing ¼ horsepower.

The starting rheostat is of the plug-drum type. This type of rheostat is a cylinder mounted on the motor frame and has a contact arc with two steps; the arc short-circuits the resistances in turn.

Propelling Motors.

Propelling Submarine Torpedo Boats.

The following description applies to the installation of the *Plunger:*

Gasolene Engine.—The main motive power is supplied by an "Otto" gas engine of the inverted marine type, built by the Otto

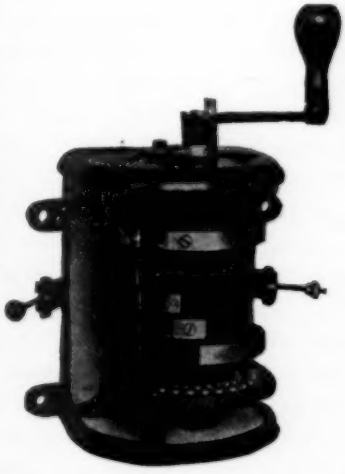


FIG. 203.—Non-reverse drum controller. 14-inch lathe.

Gas Engine Works, having four single-acting cylinders, diameter 11¼ inches, stroke 14 inches, in pairs, mounted upon one frame which is bolted to the engine bed. It is of 160 horsepower, at 360 r. p. m., and consumes about .853 pint of gasolene per horsepower hour. It is fed from a gasolene tank of 850 gallons capacity. The engine drives the boat at a speed of about 8 knots per hour at full speed. The engine is intended to drive the vessel while on the surface only; it also drives the main motor as a dynamo to charge the storage battery. Under water, the engine is disconnected from the main shaft of the vessel and the motor is used as the propelling power.

The engine drives the propeller, the motor used as a generator and the air compressor.

Each pair of cylinders has one common jacket cast in one piece with the two cylinders. The cylinders, cylinder heads, and exhaust-valve casings are water-jacketed throughout, each pair of cylinders having one common jacket cast in one piece with the two cylinders. The circulating pump, capacity 40 gallons per minute, is driven by a gearing from the engine. From the exhaust-valve casings, the circulating water is carried through a pipe connection to a water-jacket on the exhaust pipe and so overboard. The pistons are of the trunk type with long-bearing surfaces, running tight, and having four packing rings each. They act as cross-heads, the connecting rods being attached directly to the pistons. The crank shaft is supported by three main bearings, one at each end and one in the middle. The bearings are lined with phosphor bronze. The exhaust valves are located on the top of the cylinder head, the gasolene and air valves on the starboard side of the cylinder head, the air suction being taken from the closed crank pit. All valves are of the poppet type, and are operated by levers actuated by cams on the fore and aft shaft on the starboard side near the top of the cylinders. All valves have spring returns. The cam shaft makes one-half the number of revolutions of the crank shaft, the motion being transmitted from the latter by two pairs of skew gears through a vertical intermediate shaft on the after end of the engine. The oil reservoirs are located on the port side of the engine, one on each pair of cylinders. Each reservoir is provided with compartments for cylinder oil and for oil for bearings, with sight feed and valves for adjusting the flow. The governor is of the centrifugal ball type, and controls the speed of the engine by regulating the charges of fuel admitted.

The igniters are electric, of the make and break type. The plug consists of a cast-brass shell projecting into the explosion chamber, the outer end carrying an oval flange for securing to the cylinder. The axis holes are bored through the plug-carrying rods Nos. 1 and 2. Rod No. 1 has a gas-tight shoulder joint, and is grounded to the plug; it carries on its inner end a contact, platinum-tipped, which works between a platinum ring on the end of rod No. 2, and a stop on the inner face of the sparking plug. The outer end is fitted with a spring return trip operated

by a blade on an eccentric rod connected to the valve shaft of the engine. No. 2 hole contains a stationary rod, tipped on the inner end with a platinum ring, where the contact is made and broken. This rod is insulated from the plug by an asbestos washer and a lava bushing, the securing nut on the outside serving as a binding post for the connection from the ignited board. The ground connection is made from the gasolene valve to the igniter board. Duplicate sparking coils are mounted on the sparking switchboard which are fed by duplicate batteries of four cells each, connected in series so that one battery may be charged while the other is in use, a double-pole, double-throw switch being fitted for this purpose. A 60-volt, 16 c. p. lamp for resistance, and a 1-ampere fuse are placed in the circuit between this switch and the main switchboard. The discharge of the igniter batteries is controlled by a triple-pole, double-throw switch. The outside poles are connected to the positive and negative ends and to the center of the battery. The middle connections are to the sparking coils and to the ground wire on the engine. Between the sparking coils and the igniters four single-throw switches are inserted, through which one coil feeds cylinders 1 and 4, while the other feeds cylinders 2 and 3.

A small gasolene hand pump is bolted to frame of the engine forward on the starboard side. This is connected to a small gasolene reservoir and the necessary valves for mixing air and fuel attached to the hand-pump cylinder. A charging pipe is led from here to each cylinder with the necessary valve for admitting charges to the cylinder.

The engines are of the "Otto" four-cycle type, the operations taking place as follows:

1. *Suction Stroke.*—During the first suction stroke of the piston with the air and gasolene valves open, a cylinder full of mixture of gasolene and air is drawn into the cylinder.

2. *Compression Stroke.*—On the return stroke, all valves are closed, the mixture is compressed, and near the end of the stroke is ignited by means of an electric spark.

3. *Expansion Stroke.*—During the following forward stroke, the piston is driven by the combustion and expansion of the mixture.

4. *Exhaust Stroke.*—During the return stroke, the products of

combustion are expelled, the exhaust valve being opened at the beginning of the stroke.

The Main Motor.—This is actuated by the gas engine, when running on the surface, as a generator, and by the storage battery, when submerged, as a motor. It is a 4-pole, shunt-wound machine, developing 70 horsepower, at 120 volts and 800 r. p. m. By means of switches in the armature circuit on the main switchboard, it is reversible in direction of rotation. With storage batteries in series, it operates at 60 volts. Working as a dynamo, at 800 r. p. m., it delivers 500 amperes at 60 to 70 volts, to charge the battery; the usual charging current will be lower than this. The machine is designed and tested for 25 per cent overload at 120 volts for a half-hour's run without injury to the insulation.

The storage batteries are of the chloride accumulator type, and made by the Electric Storage Battery Company. They consist of 60 cells and appurtenances, are installed in two water-tight tanks, forming part of the structure of the vessel, lined with wood covered with sheet lead, 6 pounds to the foot (about 0.1 inch), five sheets being used, one each for ends, sides, and bottom, all seams being well lapped and burned bright. The forward tank contains 35 cells, the after tank 25 cells, arranged 5 cells in a row. They are connected in series in one set of 30 cells. The cells are of composite construction, having a steel frame with steel and wood panels, lead-encased and lead-lined, measuring approximately 13½ by 19 by 33½ inches in height, outside, and weighing about 288 pounds. The lead lining weighs 6 pounds per square foot, the bottom 8 pounds, and the covering 4 pounds. An extra flange, ¾-inch wide, extends across the ends of the cells, at the top, to prevent the liquid in the cells from slopping over the edges in diving and rising. A ledge across the ends of the cells, 17½ inches from the top, holds a porcelain filler to prevent the plates from shifting. A sheet of hard rubber is placed in each side of the cell against the lead lining. Each cell is seated on a wooden base, standing on eight (8) glass insulators, the insulators resting on strips of lead to prevent injury to the lead lining of the tank. The cells are wedged in place with wooden battens insulated from the cells by strips of hard rubber.

There are 60 elements consisting of 17 plates each, 9 positive and 8 negative, alternating with 8 positives and 9 negatives, to a cell.

The *positive* plates are of the Manchester type, 27⅜ by 15-5/16 by ⅜-inch thick, weighing approximately 42 pounds. The plates consist of a grid of antimony alloy, cast under pressure, having circular holes ¾ inch in diameter, filled with corrugated soft lead ribbon 5/16 inch in width, rolled in a spiral. The plate is treated by an electro-chemical process, converting it into PbO_2 which, in this condition forms the positive of the battery. The *negative* plates are of the chloride type, and are 27¼ by 15-5/10 by 5/16 inch, weighing approximately 25 pounds. The plates are formed by casting lead antimony alloy in a mould in which are arranged pellets of lead chloride ¾ by ¾ inch, in rows of 16 each. Afterwards, these plates are treated with the positives and reduced to pure lead in a spongy condition. The plates, excepting those leading out at the end, are supported in tandem, one positive and one negative, by copper bars ⅞ by ⅛ inch covered with lead, outside dimensions being 1⅜ by ¼ inch, which rest upon strips of hard rubber on the top of the cells. At each point of contact at the top of the tanks, a hard rubber sleeve is slipped over the bars to insulate them from moisture creeping along the top of the hard rubber insulation. The plates are steadied in place by strips of hard rubber, with T-shaped heads, projecting into the cells the length of the plate, at three places, at each end and in the middle. The plates in the terminal cells, forward and aft, are connected in series by equalizing strips of copper, covered with lead.

The battery terminals lead through porcelain sleeves, corrugated to prevent creeping of acid, extending through flanges on the battery tanks. The terminals are connected to standard insulated wire of 658,000 c. m. by a copper "L," sweated on to the terminal and wire. The wire is led through conduit to the switchboard. The outlets and ends of conduit are enclosed in a wooden box filled with pitch, with a covering board to protect them from mechanical injury.

The cells are charged with the electrolyte, sulphuric acid, and distilled water, with a specific gravity of 1210, until the plates are entirely covered. Distilled water should be added from time to time to replace water lost by evaporation, an exposure of the elements to the air resulting in loss of capacity. As some acid is lost in the spray by ebullition while charging, this also should be replaced from time to time. The weight of electrolyte for each

cell is 220 pounds. Internal resistance of cell when charged, .00015 to .0002 ohm.

[NOTE 25.—The following is an epitome of the instructions entered in *The Record of Electrical Appliances,* furnished vessels using storage batteries:

The simple action of the cell is: When properly discharged, both the positive and negative plates (plugs or active material) is coated with a **black sulphate of lead,** the SO_4 to produce it being derived from the electrolyte, whose density is therefore diminished as the discharge takes place. When charged, the positive plate is surfaced with PbO_2, while the negative plate is surfaced with Pb, in a spongy state, the SO_4 being given back to the electrolyte, whose density is therefore increased as the charging takes place. The difference of potentials between the plates, renders the system analagous to a primary battery. **The positive plate is the positive pole in storage batteries,** and not the negative as in primary batteries.

1. **A battery must always be charged in the right direction.**

This should be self-evident from the difference in construction of the positive and negative grids (plates).

2. **Be careful to give the right amount of charge. Do not undercharge or overcharge to an excessive degree.**

The desirable sulphate of lead which is to be deposited on the positive and negative grids by discharge is the **black sulphate,** which is readily dissolved back into the electrolyte in the process of charging. There is another sulphate produced by undercharging and overcharging known as the **white sulphate,** which is an insulator, which is not soluble in the electrolyte during the process of charging or discharging, and which attaches itself to the grid in the form of an insulating scale producing a condition analagous to the polarizing of primary cells; the formation of this **white sulphate** is technically spoken of as **sulphating.** While the sulphating of undercharging can be partially dissolved by increasing the rate, still the tendency is rather to clear the plate by shaking off the white sulphate with black sulphate, as a sediment, to the bottom of the cell. In addition to sulphating, overcharging produces:

(a) **Buckling:** This is a permanent curvature of the grids due to unequal expansion and may continue until a positive and negative grid touch and the cell becomes short-circuited, with instantaneous and ruinous discharge. (b) **Excessive gassing:** The boiling or ebullition is not a heat phenomenon, it is merely the escape of gas, mainly hydrogen; its deleterious property is the throwing out of the electrolyte in spray, decreasing its level and likely to expose the grids to the action of the air. (c) **Sulphating between the plugs** (active material) **and the containing grid**—this insulates the plugs, is practically insoluble, and assists in unequal expansion to cause buckling.

3. **The battery should be charged at the normal rate,** for which a good rule is to allow 8 amperes per square foot of plate; but this refers to the current at starting; for, constant current, while a good method, takes twice as long as constant voltage.

4. **The battery should be charged at proper voltage, to rated voltage per cell, and at rated time interval.** The voltage to be used is 2.6 to 2.7 volts per cell; for 30 cells, 79 or 80 volts will be the total voltage to be maintained across the battery terminals; under these conditions the battery will have received 50 per cent of its total charge at the end of the first hour, 75 per cent at the end of the second hour, and 83 per cent at the end of the third hour, the remaining 17 per cent will probably be received in another half hour. Completed charging is indicated when each cell shows an individual voltage of 2.5 volts (or as rated) **and no rise of voltage has taken place in the period of 30 minutes.** The "8-hour rate" of charge and discharge is that contemplated for batteries of laboratories, but the "4-hour rate" or less is usual for submarine and launch batteries, the grids being especially spun to prolong the life of the cells for the more severe service.

Any attempt to hurry the charging of a battery, technically **pounding,** will result in occasioning shortened life through rapid deterioration of the grids as well as resulting in loss of energy; under best working conditions in practice a storage battery cannot be expected to show a greater efficiency than 70 per cent.

5. **Do not over-discharge.** The effects of sulphating and buckling are much enhanced by a violation of this principle; the loss from sediment is also increased. The normal rate of discharge is, generally speaking, about 6 amperes per square foot of plate. The limit of discharge is when the voltage per cell is 1.75 and corresponds to a reduction of the total charge to about one-third of its original value.

6. **Do not allow the battery to stand completely discharged, nor its temperature to exceed 100 degrees F.** If it is not possible to full-charge it at once, then a partial charge must be given and **the charge completed before any discharge is again taken.** Rise in temperature decreases the capacity of the battery (about one-half per cent for each degree rise) and increases its internal resistance; the rise is due to the Joule effect, the current set up by local action between the active material and the support plate, the current set up by local action in the plugs, and the heat losses corresponding to the electrolysis of the solution. Heating is the usual result of abnormal charging and discharging.

7. **Keep the electrolyte at the proper specific gravity and at the proper height above the top of the plates.** The top of the grids should be one-half to three-quarters of an inch below the surface of the electrolyte. A curve of densities is practicable for variations in percentage of the charge, and comparison with the actual as shown by the hydrometer during charging and discharge will show whether water or electrolyte is to be added; these are introduced at the bottom of the cell, the gassing acting as an automatic stirrer.

8. **Keep the cells free from dirt and all foreign substances.** It is probable that lead alone of all the metals forms a sulphate that is practically insoluble and unacted upon in water and dilute sulphuric acid; lead also combines with oxygen to form a peroxide, having a good electrical produc-

tivity and equally unaffected by the liquid; hence all other metals must be rigorously excluded.

Nitrogen compounds, especially ammonia, have a seriously deleterious effect on the durability, efficiency, and behavior of storage batteries. Ammonia is found to cause an excessive disintegration or shedding of active material at the PbO_2 plate; it becomes deposited upon the negative plate and closes the pores of the active material, causing a decrease in ampere-hour efficiency of from 10 to 60 per cent in 12 months. The use of water from the boilers and termed "distilled" is a meretricious practice.

Salt water in the cell occasions in the chemical action a liberal evolution of chlorine gas; this is an especially bad feature in a submarine, from its effect on personnel.

A species of "dirt" requiring especial attention is **the crust** from crystallization from the electrolyte, and dust, which forms on the upper, inner side of the containing vessel, creating an excess loss of electrolyte through capillary attraction and subsequent evaporation.

Another form is **the sediment** deposited under even best working conditions by scaling from the plates; the deposit is greatest in amount near the center of the cell, and, being a conductor, can short-circuit the cell if it touches two plates of opposite polarity. It should be carefully raked out with a hard wood or hard rubber hoe—no metal in the construction—then scooped out of the cell; in submarines, however, it is usually necessary to draw off the electrolyte and flush out the sediment. It is very careless to allow sediment to touch the plate.

Another form of dirt is the formation of **lead trees** between the plates, producing a ready thoroughfare for short-circuiting. Inspection should, therefore, include a careful examination for lead trees between each plate, and their removal by a thin wand of hard wood or hard rubber.

9. **Keep the battery and all connections clean; keep all bolted connections tight.** Evidently cleanliness and brightness and tightness of connection reduce circuit losses in resistances to minimum.

10. **If there are any low cells in a battery, do not delay in locating and repairing them.**

Each cell is expected to produce the same E. M. F. as every other cell. If it does not it should be cut out, examined for short circuit or other cause, repaired even to returning to the manufacturer, and charged to the individual voltage of the other cells before being again connected in.

11. **Do not charge the battery too frequently.** The greatest wear on the plates occurs during the final part of a charge. When a battery has been discharged one-half or two-thirds its capacity, charging should begin in an hour. If the battery is in daily or frequent use, and only small discharges are made, use one-half the total battery charge before commencing to charge again.

If the discharges are infrequent and not sufficient to amount to one-half full charge in a week, recharge to full charge once a week; a battery which stands idle for some little time can seldom regain its charge by merely recharging; if full capacity is desired the battery should be discharged and

this followed by a full charge. All storage batteries automatically and slowly discharge, due to local action.

12. **A new battery should be set up and filled with electrolyte as soon as practicable.** It should then be given an initial charge in at least 12 cycles, charging and discharging, at a reduced time rate, the operation requiring about 144 hours—about 160 hours if not continuous. A battery does not reach best working conditions until it has had about 20 cycles. The initial charge of a battery that has been placed out of commission is to be given in the same way as if a new battery.

13. **To place a battery out of commission:**

(a) First charge the battery fully, no matter what the charge it already contains, and see that all cells are in condition.

(b) Next siphon off the electrolyte immediately filling the cell with water to the usual height of the electrolyte. This removes surplus acid from the plates.

(c) Discharge the battery slowly until it tests about one volt per cell.

(d) Then take out the plates and allow them to dry.

If the negatives become hot enough to steam they should be again rinsed or sprinkled with clean water and allowed to dry thoroughly; when dry the negatives should be replaced in electrolyte of 1.275 to 1.300 specific gravity and allowed to soak for three or four hours; after rinsing and drying again they are ready to be put away.

14. When the plates are in the vessel, whether the cell be filled with electrolyte or water or not, they should be securely chocked to prevent any swinging that would tear them away from the hangers.

The Cadmium Test.—The maintenance of the voltage and consequently the capacity of the cell depends on both the positive and negative plates and, therefore, if one be fully charged or fully reduced, and the other imperfectly charged, the capacity is small, being equal only to that of the least efficient plate; the battery is quickly discharged, and the voltage curve falls rapidly. It is necessary that both the positive and negative elements should be completely charged. The voltage of the battery is not always an indication of the state of charge, and in order to determine the condition of the two plates, it is necessary to test them independently. This is done by immersing a piece of metal, either zinc or cadmium, in the electrolyte and observing the voltage between it, and the positive and negative elements. Zinc is hardly used at all now, owing to the fact that pure zinc is difficult to obtain, and it is soluble in the electrolyte when impure. If any portion be dissolved it has a tendency to deposit during charge on the negative plate and erroneous readings would therefore result.

In using cadmium, which also must be free from marked impurities, the surface of the metal should never be scraped bright, but it should be "aged," that is, slightly oxidized. The reason for this is, that there is a difference of potential between bright cadmium and cadmium oxide, and the bright surface oxidizes so quickly that it would be necessary to scrape the test piece after each reading. The cadmium must not come in contact with any of the plates or connections and the best way to obviate the possi-

bility of such contact, is to cover it with rubber and perforate the covering with numerous small holes.

When a battery is discharged, that is, down to 1.8 volts, the voltage between the cadmium test piece and the positive plate should be about 2.05 and between the cadmium and the negative plate .25, the cadmium being positive to both the elements in the voltaic sense. The voltage of the cell equals 2.05 minus .25 equals 1.8, the cadmium negative reading being subtracted from the positive reading, when both readings are in the same direction. These readings must be made while the cell is discharging at normal rate.

When the battery is full charged, and the normal charging current is still passing in, the voltage between the cadmium and the positive plate should be about 2.35 and the voltage between the cadmium and the negative .18 to .20, the cadmium being positive to the positive plate and negative to the negative plate; that is to say, voltaically considered, the negative plate becomes more highly electro-positive and instead of being negative to the cadmium, as when discharged, it becomes positive to it.

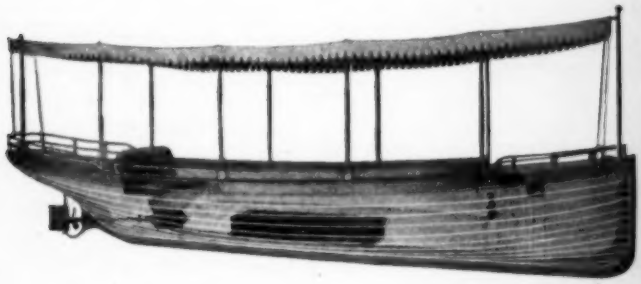


FIG. 204.—Arrangement of boat equipment (commercial).

At the end of the discharge, the cadmium is positive to the peroxide plate, the voltage between them being about 2.05. It is also positive to the sponge lead plate, the voltage between these two being about .25. The voltage between the plates is obviously the difference of the cadmium readings which is 1.8.

At the end of the charging the cadmium is still positive to the peroxide plate, and the potential difference between them has increased. The sponge lead element has changed so that the cadmium is no longer positive to it, but negative. The voltage between the cadmium and positive is 2.32; between cadmium and negative—reading in the opposite direction, however—.18; and the voltage between the plates is the sum of these two, or 2.5. In making all three readings, the sum or the difference of the two cadmium readings as the case may be, should be equal to the observed voltage of the cell, though it is somewhat difficult in practice to measure these voltages accurately enough to make them check exactly, because of the small deflection produced between the cadmium and the negative plate.

Instances have come under observation where cells on charge have shown as high as 2.5 volts and the reading between the cadmium and negative plates practically zero, showing that though the positives were fully charged the negatives were not, and these cells showed little or no capacity. On continuing the charging current for some time, the negatives were finally reduced to lead sponge and the battery then showed full capacity.]

Propelling Electric Launches.

The installation for a 33-foot launch is illustrated in the phantom cut of Fig. 204, which is that for a commercial type of 30-foot cutter requiring 48 storage battery cells, arranged in 4 rows of 12 each; the 33-foot launch is provided with 92 cells arranged in 4 rows.

The launch motor is shunt-wound and develops 12 horsepower when driving the propeller at 560 r. p. m. It is direct-connected to the propeller shaft.

The controller is located under the forecastle deck and its cylinder is rotated by a shaft extending through the forecastle compartment bulkhead, the drum carrying the tiller ropes and revolved by the steering wheel is a sleeve on the controller shaft, the hand wheel on the end of the controller shaft retaining the drum in place. The controller connections accomplish on the five ahead positions the following variations of power, endurance, and propeller speed:

Position.	Volts.	Amp.	No. Hours to Run.	R. P. M.
1	50	26½	35 to 40	274
2	99	25½	22	345
3	99	38	14	415
4	194	41	6	526
5	190	60	Spurting only.	595

The third position is the normal and proper position for operation, and the boat should be stopped when the voltage falls in running to 78 by voltmeter. Position 1 will be evidently for a multiple arrangement of battery of 4 in parallel and 23 in series; positions 2 and 3 for 46 in series and 2 in parallel; and positions 4 and 5 for 92 in series, the difference between them being for difference of resistance in the armature circuit.

The controller being thus arranged for changing the connections of the cells as to the number in series or in parallel, the battery can be charged through the controller as a switch by setting

the controller, at the desirable position. This is position 2 for a 110-volt or 125-volt source. The connection for the charging source is through a special plug switch in the forecastle compartment.

To imform the coxswain as to the current of discharge and remaining total voltage, an ammeter and voltmeter are installed inside the forecastle bulkhead, their scales showing through glass-covered ports.

The battery used is of the Exide type, a form of pasted plate, in which the positive grid has its vertical ribs spaced unevenly, the ribs bringing closer together on the side away from the terminal lug. This is to give better conductivity at points farthest from the terminal and to effect even distribution of current over the plate surface. The cells are small but, with the exception of the smaller capacity, they follow the general rules of storage batteries in Note 25 and furnish an especial example of 11 in that note as follows: *Do not charge too frequently.* If with a battery that will run the launch 40 miles, the launch is run 5 miles, then charged; taken out again, run 10 miles, and charged; given another run of 10 miles and charged, and a third time run of 10 miles and charged again, the launch has run but 35 miles and been charged three times more than necessary, and, moreover, the battery has been strained owing to three unnecessary effects at the final part of charging; that is, it has had three unnecessary and important deteriorating stresses.

The launch type of cells are constructed with a view to the rapid time rate of charging and discharging of 5 hours and for that reason, if it is desired to hurry the charge of, or pound, the battery in emergency, it can be done, provided the shortening of the time is done in the first half of the charging; *the last half must be done at the normal rate* (see II, Note 25). As the cells are tightly covered they are freer from access of dirt and foreign matter, and salt water is mainly to be guarded against. If it gets in a cell the cell must be emptied and refilled with electrolyte, as the Exide cell is very subject to heat effects. Keeping the controller contacts bright with sandpaper and watching minimum voltage are the other chief concerns outside of usual battery care and management.

Motor Generator.

In general, a motor generator is a generating set in which the drive is by electric motor, and as a rule the generator and motor are separate and direct-connected. Ordinarily the dynamotor or rotary transformer is included in the motor-generator classification, although the dynamo and motor are combined in one device.

The utility of the motor generator in conserving energy has already been explained in Note 24.

There are five types in use in the Naval Service: The motor generator for turret-turning or gun-elevating; the motor generator for wireless; the dynamotor, or rotary transformer; the balancer and the rotary compensator.

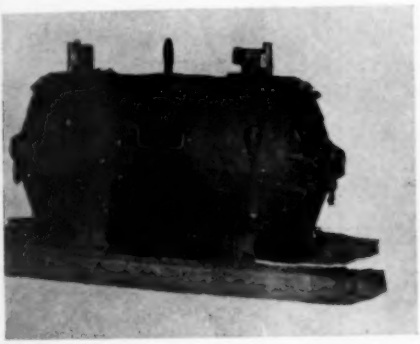


FIG. 205.—Motor generator for turret-turning and gun-elevating.

Motor Generator for Turret-Turning or Gun-Elevating.—This apparatus, shown in Fig. 205, is of the enclosed armored type, but is of the typical motor-generator arrangement, as shown for the motor generator for wireless (Fig. 206).

The motor generator differs in k. w. output for the class of service for which it is to be used (turret-turning or gun-elevating), but has the same output voltage at the generator terminals as that of the supply line, 125 volts. The motor construction and generator construction, within the same case, follow that previously described for the turret-turning motor .

The connections for starting the motor end and for taking off supply to the turret-turning or gun-elevating motors are shown in Figs. 147 and 160.

Motor Generator for Wireless.—This combination is shown in Fig. 206, and has not thus far been supplied in an enclosed form. The essential difference in this machine and that of Fig. 205 is that the voltage generated by its dynamo is alternating.

There are a number of sizes, but that usually supplied a vessel is of 2 to 3 k. w. capacity, at 65 volts and 60 cycles.

The type is for supplying the primaries of wireless transmitters.

The Dynamotor.—This apparatus is used for supplying the voltage for call bell and general alarm circuits in lieu of primary batteries.

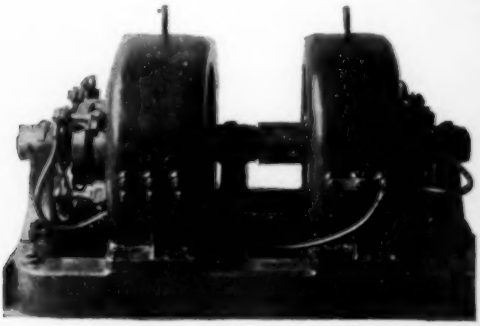


FIG. 206.—Motor generator for wireless: generating alternating current.

[NOTE 26.—The distinction between the dynamotor and motor generator is that the motor dynamo has **a separate field** for its motor and its dynamo, two fields and two armatures, while the dynamotor has **both the motor and armature windings on the same armature core, requiring a single field only.** The primary armature winding, which gives the motor action to drive the machine, is first wound into the slots. The secondary winding which gives the generator action to produce the new voltage, is wound in over the motor winding and in the same slots. The magnetic effects and armature reactions of one winding thus neutralize those of the other, outside strains on the shaft are eliminated, the duty on the bearings is reduced, and the energy which is required in the motor generator for energizing a second set of fields is saved. Dynamotors are more efficient than motor generators; have no tendency to spark; there is no occasion for moving the brushes for varying loads since the line of commutation does not shift due to the fact that the armature reaction produced by the motor winding is opposite in effect to that of the dynamo winding. They can in consequence stand a greater overload than motor generators, but their E. M. F. drops because they cannot be compound wound to compensate for the slowing down and for the resistance of the winding.

The ratio of transformation of dynamotors cannot be varied or adjusted, since both windings are on the same core and under the influence of the same field. Any adjustment of field strength (as usually employed on a dynamo) will simply make them run faster or slower. As the ratio of the turns on the dynamo end to those on the motor end is unchangeable, the voltages at the two ends will remain in the same ratio. Therefore, **when it is desired to vary the voltage** to be given out by the dynamo, a motor generator (motor dynamo), a double field machine, is mandatory in order that its dynamo windings may be on a separate core and magnetized by a separate field.]

The type of dynamotor in use (Fig. 207) is known as the ¼-horsepower size, has a speed of 1800 r. p. m., and takes, at the motor end, an input of 2.5 to 4.0 amperes at 80 volts, transforming to 80 watts, at 20 volts, at the dynamo terminals; 20 volts

FIG. 207.—Latest type of dynamotor.

being the operating voltage for general alarm gongs. The number of brushes for the dynamo end are but two in the original design, 180 degrees apart; it was found that two extra brushes, tapping off 13.3 volts and 6.6 volts could be added without sparking and this arrangement is now often followed for the main call-bell lines (13 volts) and call bells for quarters (6 volts).

The Balancer.—This apparatus is similar in its general construction to the motor generator of Fig. 205, except that its motor is series-wound. It is supplied in supersession of the search-light rheostat to avoid the large loss in heat; for if the rheostat were used with the 60-inch lamp, for instance, the energy consumed would be 125 volts × 200 amperes = 25 k. w., of which the lamp only requires 60 × 200 = 12 k. w., the remaining 13 k. w. being wasted in heat in the rheostat, including a small amount in the circuit.

The scheme of operation can be understood from the elementary diagrams of Fig. 208.

In the upper diagram the connections are shown, including the starting rheostat, which is between the dynamo armature *D*, and the negative current supply line. The shunts on the series field windings are for the purpose of adjustment in manufacture. The paths of current flow, before the arc is struck, are as indicated by the arrow heads. The dynamo *D* is excited by a shunt field across the current supply leads, and in this initial condition,

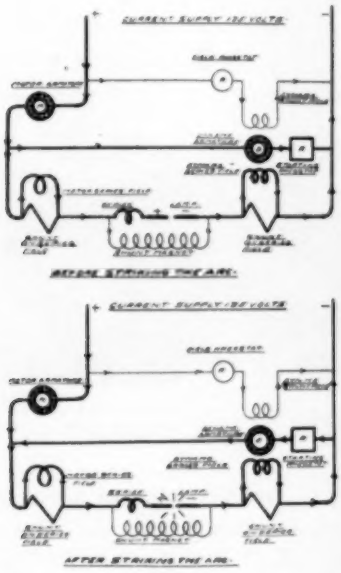


FIG. 208.—Elementary diagram of balancer.

operates as a motor, driving the motor armature *M*, which is on the same shaft. It will be noted that there is but a slight current in the two series fields, owing to the resistance of the shunt magnet coils of the projector lamp, which is in circuit, and the very low resistance of the motor armature, the carbons being separated. This current in the series fields of the dynamo and motor is too small to affect the conditions. The shunt magnet coils of the lamp have practically full line voltage on their terminals, and, consequently, actively operate the mechanism feeding the carbons together.

As soon as they come in contact, the arc-striking magnet coils in series with the carbons are excited and separating the carbons "strikes the arc." The current flow is now indicated in the lower diagram.

The current flow in the series coil of the dynamo now opposes the excitation of the shunt field reducing the magnetism and causing the counter electromotive force to be lowered. At the same time, however, the same current flow in the series field of the motor, causes its armature to become an active factor, and its counter electromotive force replaces that of the dynamo, which no longer acts as a motor.

As the carbons burn apart, the length and resistance of the arc increase, causing a weakening of the series field on the motor which causes it to speed up. There is also a weakening of the differential series field of the dynamo, which allows the shunt field to become relatively more active. These two effects tend to increase the voltage, and cause the shunt magnet coils of the lamp to operate to bring the carbons together to their normal distance of separation and to increase the current in the arc.

In the case of too short an arc, from any cause, the excess of current will cause the motor to slow down, and the differential effect of the series coil on the dynamo field will lower its voltage.

The shunt-field rheostat gives a means of compensating for the variations in operation, such as cool or warm windings on the motor, dynamo, or lamp.

The particular feature of the balancer is the opposing of the excess of line voltage, by counter E. M. F. of the armature of a series-wound motor in series with the lamp; and the generation of an increment of current supply by the E. M. F. of the armature of a differentially compound-wound dynamo which, added to that furnished by the supply lines, is sufficient for the operation of the lamp.

The special features of transfer of motor function in starting, of generation of the necessary increment of current, and of automatic regulation in operation, constitute a very unique and satisfactory system of control.

The Rotary Compensator.—This is the most recent combination of a motor generator for turret-turning whose object is to farther reduce the slow speed of the turret as obtained by the

series connection of the turret motors, described in Note 24, and as there stated about 6 degrees per minute minimum.

For the purposes of the rotary compensator the turret has one large motor and one small motor (of about one-fifth the horse-power of the large), instead of two large motors.

A magnetic clutch and gearing is so arranged that the turret can be turned by the small motor alone from *about ¼ degree to 4 degrees per minute.* The large motor is directly connected to the gearing of the turret and will turn it from about 5 degrees to

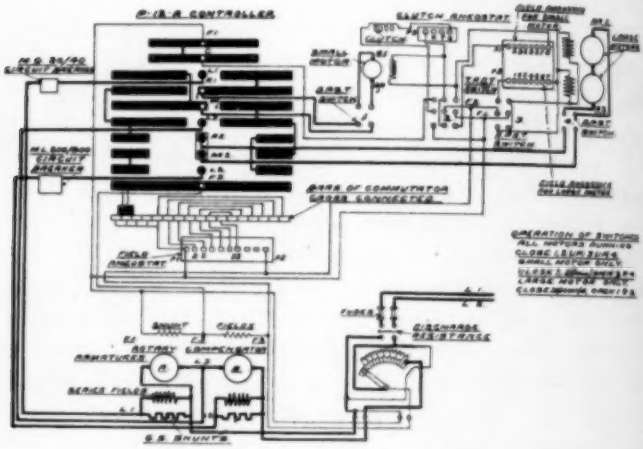


FIG. 209.—Connections for turret-turning using rotary compensator (three turning motors shown).

100 degrees per minute. The armature connections of the large motor are not made until the small motor has brought the turret up to the minimum speed at which the large motor will turn it, at which time the clutch is released and the large motor turns the turret. For convenience, both the large and small motors are arranged to have some field control, permitting the turret to be turned by the small motor up to a maximum speed of about 6½ degrees per minute, and by the large motor down to about 4½ degrees per minute when either motor is running alone.

The rotary compensator whose connection to the motors is shown in Fig. 209, while similar in appearance to a motor gener-

ator, is quite different in its action. It consists of two armatures mounted upon one shaft and turning in two separate magnetic fields. The armatures are connected in series and the shunt-field windings are also in series.

[NOTE 27.—Fig. 209 really shows the arrangement as now applied to vessels which already have two motors installed for turning each of their turrets; in an *original* installation but one large and one small motor are to be installed.]

A rheostat is placed in shunt with the two fields, which are in series, the center of the rheostat arm being connected to the junction of the shunt fields. When this arm is turned to short-circuit, the shunt field of the armature in multiple with the small motor, there will be practically no difference of potential across the armature terminals, but the other armature will be operating, in a full field at maximum voltage. As the arm is gradually moved across the rheostat, the resistance in multiple with the first field increased, causing the field to strengthen, while the resistance in multiple with the second field decreases, reducing its field current and correspondingly reducing the voltage across the terminals.

When both motor circuits are opened, the current necessary to drive the set light passes through the two armatures in series, but when one of the motors is loaded the amount of current which it takes depends upon the voltage obtained upon the field of the armature with which it is in multiple. The current for this motor is, therefore, derived partly through the other armature and partly from the armature with which it is in multiple, which may be acting as a generator.

If the motor is running at very low voltage, the current required may be considerably more than would be necessary to drive the set, and also drive the armature with which it is in multiple, which latter would then generate sufficient current to make up the difference; but if the motor is running at practically full voltage, then probably all of the current will come from the line, through the other armature, and none will be generated by the armature in multiple with the motor.

It will be noted that the set is similar to two separate generators, each running its own motor, but which differs in that some

of the current is always taken from the line. It has a considerable advantage over the motor generator set in the design of the controller, since a change in the shunt resistance affects both the fields, and in this design this means a very large increase in the number of speeds obtainable without a large increase in the number of rheostat leads.

The field contacts of the controller are made on the end of the commutator which is so cross-connected that, as the contact brush passes over the contacts, it brings the voltage of the small motor to a maximum when it has passed through half of its motion (at which time the voltage of the large motor is minimum) and then reverses the operation during the other half of its travel, bringing the large motor to a maximum, and the small motor to a minimum speed. A carbon brush is used for making contact with the commutator above described, whose resistance gives a multiplying effect, and thus furnishes a much smoother acceleration curve than would be obtained under ordinary circumstances.

DISCUSSION.

Storekeeping at the Navy Yards.

(See No. 121.)

Pay Inspector T. H. Hicks, U. S. Navy.—It would seem impossible for any one having even only a casual acquaintance with the storekeeping system of the navy, to read the essay of Pay Inspector Mudd on this subject and not to be convinced of the soundness of his arguments. Only some bureau representative may desire to make his own purchases, and to have his own storehouse in the navy yard. In this progressive age, however, every tendency is toward centralizaion. Anything so pernicious as separate yard department storehouses will be condemned by every fair-minded naval officer who looks beyond his own navy yard, bureau or department, toward the general welfare of the navy.

Under the plan proposed by Pay Inspector Mudd, an adequate supply of all stock common to bureaus, and indeed also stock used by one bureau only, would be carried in the general storehouse, and not only the need, but even the excuse for maintaining separate storehouses, would be done away with. Such advancement has been made in storekeeping methods in the navy, and the bookkeeping connected therewith, that the time has at last come, in my opinion, when all the various accounts should be consolidated into one common general account, and all the stocks into one common general stock. The system advocated by the prize essayist looking toward the absorption by naval supply fund of all articles now carried in the various accounts, would seem to cover every possible desire for purchasing, storing, and distributing all supplies, of whatever description, for the navy. Furthermore, it possesses the additional advantage of not charging annual appropriations until the supplies are actually about to be used, and thereby obviates unnecessary expenditures of money, and absorption of valuable storeroom space. It would also circumvent the present absurd system by which supplies in store cannot be used when urgently needed, because a head of the department for which the stores have been purchased, may refuse to permit their issue, alleging a possible need for the articles in his own department.

I am particularly impressed with Pay Inspector Mudd's proposed method (page 26) of maintaining a necessary reserve supply, by placing such reserve supply with the rest of the stock of the same item, and increasing the low limit on the stock tally card by the amount of the reserve stock.

I cannot advocate too strongly, the necessity for a rigid penalty system in making purchases for the navy, and I believe that it would be even more necessary than at present, should all supplies be purchased for, and issued from, a common general stock. Such a system is, I firmly believe,

absolutely necessary, in order to obtain deliveries in accordance with the contracts made, and thereby to prevent the depletion of stock.

I would go even farther than Pay Inspector Mudd in suggesting changes in methods of inspection, and in that respect, submit the following suggestions:

1. That the Board of Inspection at navy yards as constituted at present be abolished.

2. That the records of inspection now kept by the Board of Inspection, be kept in the general storekeeper's office.

3. That inspection calls be prepared as at present, and forwarded to the yard department concerned, when the inspection will be made and the call signed by the head of the department, and the name of the officer who actually made the inspection entered upon the face of the call.

4. That upon completion, the inspection call be returned direct to the general storekeeper's office, where it would follow its present course.

5. That in cases of rejection, where the contractor requests a reinspection, the commandant shall designate a referee, who will inspect the articles in the presence of the contractor's representative and a representative of the yard department concerned, and shall then pass or reject the articles.

6. That the yard chemist be directly responsible to the commandant for the performance of his duties, and that the commandant decide when questions are raised, as to which supplies shall be first inspected by the yard chemist.

My reason for recommending the abolition of the Board of Inspection at navy yards, is the belief that the board serves no useful purpose. I think it is conservative to state that the whole board never sees, and has no practical knowledge of, 90 per cent of the supplies which it nominally acts upon. There must always be more or less delay in the passing of inspection calls through the board, and considerable expense is undoubtedly entailed upon the government in maintaining offices for these boards. It seems a pity, that in the present plans for expediting deliveries of supplies, and payment therefor, there should be retained such an unnecessary obstacle as the present Board of Inspection. During my period of service in charge of the provisions and clothing department of the New York yard, I was the inspecting officer for that department, and I do not believe that I consulted the Board of Inspection more than once in fifty times, and then usually only in cases of disputes with contractors.

Frequently during the Spanish war, and occasionally at other times, I received supplies into the storehouse, inspected them, and shipped them to other points before the inspection call ever reached the Board of Inspection. I think it will be admitted that, in inspecting 90 per cent of the supplies delivered at navy yards, the board performs no valuable service. From a practical business standpoint, therefore, it would seem necessary to provide inspection, other than departmental, only when rejections occur and disputes are likely to ensue, and such cases will, I think, be satisfactorily disposed of, in the manner suggested above.

The plan proposed in the essay, namely, that all stock should be ab-

sorbed in one general stock carried for all departments, and drawn as needed by each department, would tend to do away with much of the bitterness, ill-feeling, and jealousy which has always been a barrier in the progress of successful storekeeping at navy yards.

I should like to add my voice also to that of the writer, in his appeal for harmony, on page 46 of the essay. If we should all endeavor to shape our work so that the greatest good shall ensue—first of all to the government, then to the navy, and then to our own bureau or corps, instead of working in the reverse order, how much more would be accomplished at the end of the year, and how much more efficiently would our work be performed. That would be impossible to state, but one might hazard a guess that the results would be very gratifying.

Lieut.-Commander J. S. MCKEAN, U. S. Navy.—The prize essay by Pay Inspector Mudd is certainly an interesting and informing one on a subject of general interest, as well as importance, to the service.

It is hoped that Congress will, in time, be brought to see the increased economy, as well as increased efficiency, that the larger fund would bring about.

The first extension of the general storekeeper system I would like to see made would be to apply it on board ship, thus doing away with a lot of yeomen, innumerable requisitions, small purchases, etc., etc., in the various departments.

Have a general store from which heads of departments on "stub requisitions" can draw the supplies for their current use. This will materially reduce the number of storerooms, the clerical force, and relieve heads of departments of a large amount of bookkeeping and money accountability. I know it was tried in a way and was alleged to have failed, but I think with a fair trial it will work, and reduce materially the necessary paper work now done by heads of departments on surveys, requisitions, balance sheets, invoices, quarterly returns, etc., all of which would be done in an office organized for that sort of work, under an officer whose work is along those lines. This would also reduce the now excessive number of so-called "politicians" on board ship.

Another suggestion it seems to me would simplify and improve the whole general storekeeper system is the establishment of a central depot—say in New York—where all purchases and inspections shall take place, except in emergencies. This central depot to bear the same relation to the various general storekeepers that the general storekeeper of a navy yard now bears to the heads of departments at that yard; and each general storekeeper to make "stub requisitions" by letter or wire on the Central Depot without having to go through the Bureau of Supplies and Accounts at all, but the various transactions to be reported monthly from both ends. This would materially reduce time, reduce paper work, and increase efficiency of inspection, by having it centralized where laboratories, testing apparatus, etc., would be provided for the use of a *permanent* Board of Inspection *without other duties.* It would decrease cost, as all stores except in emergencies could be bought in immense quanti-

ties (say six months' supply), all shipments to be bunched in carload lots. The clerical force employed by purchasing paymasters, in navy yard general storekeepers' offices, and in the bureau, could be reduced.

I am aware of the kick that would be made by the local merchants and contractors, but with a hundred million a year too little for the navy, we cannot afford to pay profits to middlemen and small dealers, or to pay express charges on small shipments, when we can get wholesale discounts and carload freight rates.

Somewhat aside from the subject of the prize essay, but in a sense parallel to it, I would suggest that Pay Inspector Mudd or some other member of our experienced pay corps write out a full and detailed plan of a commissary store system and commissary supply fund for navy yards, ships and stations, organized and handled along the lines of the general storekeeper system and naval supply fund, and giving us of the navy similar benefits to those the army now have from their system (to which by the Personnel Bill we are legally entitled).

The writer believes that this naval commissary fund could be so handled by our able pay corps as to reduce the cost of living to officers and men by the 20 per cent we *did not* get from Congress.

Asst. Naval Constructor S. M. HENRY, U. S. Navy.—The work of the general storekeeper may be classified under two general heads:

1. Supplying stores to the fleet.

2. Supplying material to the manufacturing departments of the navy yards.

The duties first referred to are of a military character, while the latter correspond to similar duties performed in all commercial industrial plants. It is entirely with the second division of the work as outlined that the following discussion is concerned.

While the keeping of accounts may be resorted to for many purposes, the most important function of such accounts must be to show the cost of work, and any system which does not accomplish this, fails in its chief object.

In navy yard work this result is not obtained, or even approximated to. If the "cost of work" done during any fiscal year were balanced against the total expenditures of the navy yard as an industrial plant, there would be a wide discrepancy. This does not mean that the books do not check, but that the so-called cost of work is only an arbitrary approximate percentage of the actual cost to the government. It is, of course, understood that such part of the navy yard force as is connected with the administration of the military side of the navy, or whose duties are of a military nature, should not be included in these expenditures. While the ideal condition of the "cost of work," showing the actual cost to the government, would be difficult to obtain and require much alteration in the present organization and methods, the discussion of "Storekeeping at the Navy Yards" would seem to be an appropriate place to suggest such changes in the present system as would at least allow the "cost of material" at navy yards to represent fairly its cost to the government.

In order to accomplish this, it would first be necessary to obtain the relative proportion of the cost of the general storekeeper's establishment, which is properly chargeable to navy yard work. This could, without great difficulty, be obtained by a careful analysis of the expenditures for a reasonable length of time. In making this division the navy could be considered as similar to two commercial organizations; 1st, a large steamship line, and, 2d, a ship yard. Each of these organizations would require some storekeeping system, which would be analogous, if combined to the present naval system.

Work completed at present has its "cost" recorded, which is considered comparable to the cost of similar work performed at private yards. With few exceptions, where attempts have been made to have more complete records of incidental charges kept, there are many important items which should properly be charged against work, but which do not appear in the present records; this condition is largely due to the bureau organization. Even in the exceptional cases above mentioned, material was charged below its actual cost to the government.

If lumber is purchased at $25 a thousand feet and $15 a thousand is expended by the general storekeeper in stowing, storing and handling it, the actual cost, not allowing for deterioration or other losses, would be $40 a thousand. The department drawing it out, however, only pays $25. Any industrial plant doing the same work must have the same handling done, the same storing and stowing. From time to time material is lost and a certain amount of deterioration cannot be avoided. At present by the mere calling of a survey, this loss is completely wiped off the records and the prices fixed at such fictitious figures as accord with the estimated values of the material left.

The complete cost of that portion of the general store system which is devoted to supplying material to the manufacturing departments should be borne by these departments in proportion to the value of the material used by them. This could be done by adding to the price of all material a percentage sufficient to cover current running expenses and loss by deterioration, disappearance, or unprofitable purchase of materials. Not only would this system have the great advantage of having the cost of work more closely approximate its actual cost, but it would have a perceptible effect in reducing this cost.

At present there is no great incentive to the economical handling and storing of material. The departments using this material have no direct interest in this so long as they do not have to bear any part of the expense and so long as no part of it appears as a charge against their work. On the other hand the general storekeeper bears the cost of this handling out of general appropriations against which there is no check or for which there is no detailed accountability. If, under the proposed system, the percentage added to the purchase price and charged to the manufacturing departments, at one navy yard was 20 per cent and in another 10 per cent, there would be a direct comparison which would be a strong stimulant to the reduction of this cost. If again it were 10 per cent where in private practice it was only 6 per cent, it would show at least that gov-

ernment methods of handling stores were less economical than those of private firms. This percentage should, of course, include all deterioration and other losses as there can be no arbitrary reduction of values where the costs of work are intended to represent actual costs. To take an example of how this sometimes works, let us assume that copper is purchased at 15 cents a pound and later the market price rises to 25 cents; the departments will still draw this, if no new invoices are received, at 15 cents. In this respect it is similar to what happens in commercial practice, but taking it the other way suppose the copper is purchased at 25 cents and later the price falls to 15 cents, the metal remaining in stock for a year or two; the head of the department then desiring such copper sees that he is paying 25 cents for what he can purchase in the open market for 15 cents, and writes a letter to the commandant stating that this material is held by the general storekeeper at an excessive price and requesting that it be surveyed and appraised. This is done, and the price of the metal is readjusted to agree with the market value. On every pound of copper drawn out thereafter the government has not only had the cost of handling and stowing, which is not charged against any work, but has actually lost by the action of the Board of Survey so far as all records concerned with costs, 10 cents on every pound.

Assuming that all material passes through the hands of the general storekeeper, such a percentage should be added to the unit price of each article as will just meet the entire percentage of the expenses of his department previously decided on, and if, in the cost of any job, the material appears as $100, there is no reason for $100 representing the average of a collection of contract costs and appraised values of material, but it should be the total cost to the government.

The appropriations of the various departments using material would then have to be increased so that they could stand this additional percentage. It would seem that Congress would be much more willing to appropriate money for work where it would be possible to see where every dollar finally went, than under a number of different heads where they paid for so-called "cost of work" and again appropriated for another department where there is apparently no production.

In order to balance between cost of work, which should correspond to receipt less profits and interest in an industrial plant, and expenditures, other changes would be necessary, but this particular one would tend toward that desirable condition and so far as material alone is concerned would put the records on nearly a correct basis.

If it is intended that all expenses incident to receiving, storing, and handling material be borne by the bureaus using it, the question arises as to how to make the actual transfers. If the unit price is proportioned as nearly as possible so as to include the estimated costs of maintaining the allotted proportion of storehouse expense, depreciation of value, loss of material, etc., there will, at the end of each month, be a credit to the general storekeeper of the difference between the purchase price of the material drawn and the total of the stubs delivered by the different departments. This difference would then cover a transfer from the current

bureau appropriations, or increase of the navy, as the case might be, to the current appropriation for the Bureau of Supplies and Accounts. This percentage obtained by transfer of appropriations would never exactly agree with the estimated proportion of the general store system expense, but as the original percentage decided on as a proper charge to the navy yard as an industrial plant could at best only be an approximation, this slight discrepancy would present no difficulties. Any slight excess or shortage of receipts from this system would be chargeable to the appropriation for maintaining the general store system for the fleet. In other words for each year a percentage would be worked out which most nearly represented the proper proportion of charges to navy yard work. The amount represented by these percentages would be transferred from the bureau appropriation to the current supplies and accounts appropriation and the difference between this and the actual cost for the general storekeeper's system would be borne by the Bureau of Supplies and Accounts as its proper cost of supplying material to the fleet. This percentage should be readjusted each year.

Naval Supply Fund.—If the same quality of material could be obtained from the naval supply fund as under purchase by the several bureaus and an adequate supply be relied on, it would appear that there could be no room for argument against this consolidation in the purchase of supplies. There can be no question that the unit price of purchases in large quantities is lower than where the same material is purchased in small lots, that the cost of clerical work incident to its purchase, the cost of handling and the cost of storing will all be less and that the recording and storing can be more simply done and require less storehouse room. With cooperation between the Bureau of Supplies and Accounts and the other bureaus, and the general storekeeper and the heads of the yard departments, there should be no reason for the quality of material obtained under this system being in any way inferior to that obtained by the bureaus themselves; although should a point ever be reached where the general storekeeper attempted to dictate to the yard departments what material they should use, or refused to sign requisitions for one class of material stating that similar material suitable for the purposes was in store, even though this were not acceptable to the head of the department concerned, the whole system would be endangered; as the officers responsible for the proper performance of the work must be at liberty to use their own best judgment in selecting materials. There should, however, be no danger of such a condition arising and all materials used by more than one department could be supplied by the naval supply fund, under the present bureau organization, to the advantage of the whole service.

In order that the material carried in store should be that which is in most frequent demand and that the several departments be kept in the closest practical touch with the general store, a board consisting of the heads of the three principal manufacturing departments, viz.: Steam engineering, equipment, and construction and repair, should annually investigate and report on the quantity and quality of stock which should be carried in the future, making such recommendations as to the general

supplies to be carried as appeared desirable, forwarding the same to the Navy Department.

In order that the quality of all material may be assured, whether purchased under naval supply fund or by the several bureaus it should be inspected and passed by a representative of the department which is the principal user of the particular article.

A great advantage of the naval supply fund extension which was not brought out in Pay Inspector Mudd's article is the fact that all material purchased under naval supply fund is eventually paid for by the bureaus using it and that the spirit of the appropriation laws is therefore carried out. The act of June 30, 1900, Article 1278, Sec. 1, Navy Regulations, so often quoted:

"All supplies purchased with moneys appropriated for the naval service shall be deemed to be purchased for the navy and not for any bureau thereof, and these supplies, together with any supplies on hand, shall be arranged, classified, consolidated, and catalogued, and issued for consumption or use under such regulations as the secretary may prescribe, without regard to the bureau for which they were purchased,"

was intended to prevent the accumulation by one department of special stores which might never be used, while other departments required the same material, or the keeping of a number of stocks of the same material at the same time; but it clearly was not intended as a means of allowing one bureau to expend money appropriated for another except to prevent the above evils. If, for example, an appropriation is asked for $20,000 to erect a certain building; and Congress, considering it unnecessary to incur so large an expense, cuts the appropriation to $10,000, it is clearly their intention to limit the expenditure of government money to this amount. The letter of the above quoted act allows $10,000 worth of material in common general stock to be drawn without making any charge against this particular appropriation. There is, therefore, the $10,000 appropriated available for labor and by means of this slight manipulation, the $20,000 building has been erected. Actual cases of such manipulation could be cited if necessary. This is, however, clearly against the spirit of the law which was intended to remedy a specific evil. One more step would then be taken towards correct accounting in that the charge against each bureau's appropriation would show the actual money expended by that bureau, and one bureau would not do work charging the cost of its material to the appropriation of a bureau whose work is of an entirely different nature.

Agreeing that the enlargement of the naval supply fund would work a material benefit to the whole service, it appears that the increase of this fund can be eventually obtained from Congress without adopting the means suggested; that is, the various bureaus turning over to naval supply fund material purchased under their appropriations and again drawing it out and charging it to the then current appropriation. Once having obtained authority to increase this fund, the general stock already purchased by the different bureaus could be transferred as suggested at market price,

the current appropriations being reimbursed so that all material other than that used only by one bureau would be under the naval supply fund, but there does not seem to be any argument contained in the proposal that in order to persuade Congress to increase this allotment, each bureau should have charged to it eventually double the cost of such supplies as it has purchased and later used.

Keeping up the Stock.—Keeping up a proper stock is of the utmost importance in efficiently carrying on repair work at navy yards. This is especially true of the navy yards at a distance from the supply centers; but the time required for obtaining supplies under any conditions and the additional cost of obtaining them on short notice is such as to put a large premium on material being on hand at the time required. With an efficient naval supply fund, it ought to be possible to obtain a far higher efficiency in this respect than is possible where certain material only is carried in naval supply fund and other similar articles under the different bureaus, and where no one officer or foreman is responsible for a proper stock being maintained. A closer check is kept on this in the departments having an officer detailed in charge of the Requisition Office, but it is impracticable for him to keep in such close touch with the stock on hand as to prevent any danger of the supply of certain classes of material becoming exhausted.

Delivery of Supplies by Contractors at the Yard.—At such navy yards as require delivery of water, all contracts should call for delivery to be made alongside the seawall or docks, unloading to be done by the government, the material to be delivered and unloading done only within the working day. The actual cost of unloading, whether done by the government or by private contractors, must be approximately the same; but where the work is done by the contractors, not only the actual time of unloading must be paid for, but the time of the men who do the work while going to and from the yard, and in addition the increased cost of labor, obtained by this means for a limited time. Where contractors at a distance are required to make their own arrangements for unloading, an increased percentage must be charged to cover unforeseen contingencies.

Inspection of Purchased Supplies.—The statement that "the Navy Yard Board of Inspection as administered at present makes a useless expense in our organization" is so evident to any one who has been connected with it that additional arguments or data scarcely seem necessary. The regulations governing the Board of Inspection are contradictory and are of such a nature as to be impossible to carry out, certain parts of them are ignored. It would seem that the efficiency of this organization is increased almost in proportion as the regulations governing its actions are neglected. Article 1329, Paragraph 1, Navy Regulations, requires that "the Board of Inspection shall carefully inspect as to quality and quantity and when necessary shall test all supplies submitted for delivery under contract or open purchase, and nothing shall be passed except by unanimous approval." If this paragraph is intended to mean that the board themselves shall do this, it is clearly impossible, as in any navy yard of size, the amount of material received is such as to make it a physical impossibility

for any board to be present at the checking of the quantity and quality of all material received. Article 1331, Paragraph 2, lays out a course of procedure in inspecting material which it would be impossible to follow and would involve great additional expense if attempted. The requirement that the representative of the head of the department should go to the general storekeeper's office or storehouse at 10.30 a. m., and make the required inspection and definitely report to the Board of Inspection not later than 2 p. m. of the same day, is clearly impossible.

According to the regulations, the inspection board exercises two functions: 1st, The inspection of all supplies delivered at the yard, except those belonging to the Department of Medicine and Surgery; and 2d, the keeping of records pertaining to these supplies.

Article 1328, paragraph 2, previously referred to, requires that the general storekeeper detail a representative to be present at all inspections to furnish information. Inspections according to the character of the material must be made in different places and require varying lengths of time. While in some cases five minutes would be adequate to determine the character of the material delivered, in others days and even weeks are required. In many cases the selections of the samples alone is the work of hours, as in the case of pig iron, and may require the material to be hauled to a distant part of the yard to have the necessary borings made. It would then be a physical impossibility for one representative to be present at all the inspections, nor would his presence be of any value as the representative member alone is cognizant of all the facts connected with the purchase and use of the material. It would entail loss of time were it necessary to wait all inspections for the presence of any one not actually doing the inspection.

Article 1329 requires all inspections to be made by the whole board. This is seldom or never done, nor could it be. The same reasons mentioned above in the case of the representative of the general storekeeper apply with equal force in this case. Neither of the permanent members are qualified to pass on all the various materials that go through the board, and a practical working of a system of inspection requires much to be done by direction rather than in person and the delays caused by attempting to have a cumbrous board actually present at the weighing of coal, counting of bolts or hooks, the boring of samples, the testing of oils and paints, etc., and many similar operations, would be such as to practically bring work to a standstill.

The two permanent members of the board with the representative member from each department form separate boards, there being, therefore, as many boards as there are departments.

The members are appointed by the commandant. The two permanent members of the board are known as the senior and junior permanent members of the Board of Inspection. The duties of the junior member are altogether nominal and consist of signing such calls as are put before him without regard to, or a knowledge of, their contents.

The senior permanent member is the practical working head of the board as far as keeping of records and forwarding of papers are concerned.

This appears to be a practical limit to his duties. In some yards this may be delegated to the junior permanent member.

In all cases the actual inspection should be performed by the representative member, as the question of passing or rejecting material is decided by him; and he alone should be responsible, if later it should appear that any material has been improperly passed or rejected. With the large number of calls passing through the hands of the representative member of a large department both for material purchased under his bureau and for the naval supply fund, it would be impracticable for these inspections to be made by a board as required by the regulations and the two permanent members, therefore, can take little active part in passing on material delivered.

The second function of the board then is that of keeping on record such information as may be required for reference.

It is impracticable for the records of the Board of Inspection to be complete in regard to all contracts; complete correspondence alone being on file in the office of the department concerned. There is on file at the Board of Inspection one copy of all calls, copies of all reports from the chemist and copies of endorsements which at the time are considered important by the senior member (this will vary somewhat in different yards). Exactly the same information is on file in the office of the representative member, or in his department, together with the correspondence which makes the records, etc., complete.

The permanent members of the board, not being in touch with the use of the material nor the conditions which led up to or correspondence which preceded the requisition, or the conditions existing at the time of inspection, are not in a position to pass on difficulties that arise between contractors and the government, so that all such questions must be referred to the representative member.

The present board system requires a multiplicity of papers referred always through the commandant from department to department by endorsement, so that there is much unnecessary paper work and consequently much loss of time. The present system of referring all papers relating to the purchase of material, etc., through the senior permanent member only to be forwarded by him by a printed endorsement to the representative member for action or report and returned through him again, adds greatly to the delay of all papers without accomplishing any useful end. The same is true when the endorsement prepared by the representative member bears the signature of the senior permanent member.

If then the functions of the board as a record office are of no practical value, the only remaining reason for its existence is either as a safeguard to the government or to the contractor. As the permanent members do not actually see either the quality or quantity of the material passed or rejected, except in exceptional cases, they cannot safeguard the government, and as any one of the three members rejecting a delivery prevents its acceptance, the board as constituted cannot safeguard the rights of the contractor.

Surveys.—The large surveys of ships going out of commission are a

source of much tedious labor. Prior to going out of commission ships turn into store all articles under Title "B," these articles are checked only against the invoices. The surveying officer of the department concerned surveys only as to quality and quantity of such articles as are contained on the survey. This system then is such as to omit the principal check which should be made on material turned into store, viz., that a ship turn into store all articles for which it is responsible. Such ships going out of commission call missing surveys on articles that they are unable to account for. This is, of course, the prescribed method of correcting their books, but a much easier way which is at times resorted to, and against which there is no effective check, is to simply invoice into store such articles as they happen to have left. This having been done the survey passes through the hands of the general storekeeper without question, and thousands of dollars worth of equipage may never even be referred to. The natural check which should be made on articles turned into store from a ship going out of commission is that the invoice into store be compared with the allowance list. In other words the ship should be responsible for all articles appearing under Title "B," on their allowance list, except such as are covered by survey or proper authority has been obtained for turning into store. No receipts would then be furnished to the ship until all items on the allowance list had been accounted for, those not being found being covered by missing surveys. Such an alteration in the system would undoubtedly show very different missing surveys than are now frequently put in by ships prior to their being put out of commission. While the present system may provide for a check at the department after the ship has been placed out of commission, this is not effective, as the practice above referred to is not prevented.

Invoices.—The delay in furnishing the general storekeeper with invoices of articles manufactured by yard departments may be due to slack methods of the department concerned or may also be caused by slackness in the general storekeeper's department. Before invoicing articles manufactured, it is necessary to have the complete labor and material cost in order to fix the unit price. This makes it necessary to use for labor and material pro-rate the percentages used during the previous month, but for the cost of material nothing can be done until the stub requisitions are returned from the storehouse. It should therefore be possible to furnish the general storekeeper with invoices of all material on the second day after the receipt from him of the last stub requisition. Any delay beyond this is the fault of the department concerned and any delays in returning the stub requisitions is the fault of the general storekeeper, so that cooperation is necessary to correct this evil.

Public Service Economy.—Any system of rewarding employees for efficient work would be highly desirable provided it did not carry with it difficulties and defects greater than the remedy obtained.

There are at present boards for nearly everything. Much valuable time and money are lost by boards doing the work that could be done by individuals and by the regular work of officers being interfered with by their enforced attendance at the meetings of these boards.

The proposed system of rewards involves the loss of time to government officers and employees ranging from the messenger boy to the President of the United States. The time consumed by going over and rejecting the numerous suggestions that will pour in where everyone has nothing to lose and a possible chance of receiving a prize, would, it is believed, far outweigh any slight advantages obtained by its operation. As desirable as any scheme would be which would compensate officers and employees in proportion to the work done by them, the proposed plan involves far too much loss of valuable time to make it desirable.

To illustrate this, let us take an example: The messenger boy decides he can fix a better routine for collecting papers or that some papers he handles are unnecessary. It is no trouble for him to make the suggestion, although it may be of no value, and so for the slight chance (because only a small percentage of the suggestions would receive awards) of his receiving $25, a board of three officers, one of whom is the commandant, would have to discuss, at the loss of considerable time, this proposition, which none of the three members on the board would probably be as capable of passing on as the head of the department concerned. Not only would the time of this board be taken up, but this paper must be referred to each head of department of the yard, to the surgeon, paymaster of the yard and the commanding officer of the marines. Assuming that the board is unfavorably impressed by the suggestion, it is not to go to Washington unless the person offering the original suggestion requests it. No trouble or expense is involved in this request and the chance of the $25 is still open, so why not request its forwarding to Washington? There again we have a still more expensive board, also the time of the judge advocate general and the commandant of the Marine Corps. Then the next step in this time-consuming operation would be, on the request of the messenger boy after unfavorable decision by this board, to forward it to the National Commission. This National Commission, having been directed by the President, must devote their time to investigate the conditions of which they are entirely ignorant, and which are altogether too small for their consideration if they be men of importance, as suggested.

As desirable as rewarding efficient service is, the means proposed seem scarcely likely to attain the results sought for.

Paymaster DAVID POTTER, U. S. Navy.—Pay Inspector Mudd's article on "Storekeeping at the Navy Yards" calls to mind the following points for particular comment:

1. Transportation of enlisted men: The present commentator is entirely in accord with Pay Inspector Mudd's opinion that this business should be transferred to the paymaster of the yard, the sooner the better. The writer has had some experience as yard pay officr and has given much reflection to the duties of the place—it is believed that, from all standpoints, transportation of men should lodge with him. It is likely that such duties fell to the storekeeper more by accident than by design. The general storekeeper's office is the natural refuge of all troublesome transactions —his is the gaping, albeit often uneasy maw, into which the unpleasant odds

and ends of business are thrown by tacit consent of everyone—except possibly himself. The paymaster of the yard, since he has the funds, ought to do the business. Pay Inspector Mudd well says, "A strange interchange of money receipts," etc. And what when the paymaster of the yard is relieved, as regularly happens, while some of the public bills made out by the general storekeeper, in favor of the paymaster of the yard, for "cash advanced," remain unpaid at the time of relieving? If the relieving paymaster is willing to accept the receipt from the general storkeeper to his predecessor, as cash, all is well. But would he not be justified in refusing to accept such receipt? And if so, what then? The relieved one would be compelled to make the money good, pending reimbursement, from his private resources—and he may have none.

The whole character of the business of transportation—its money handling, its contact with personnel, its questions of "expiration of enlistment," or "by medical survey"—certainly relate more nearly to the paymaster than the storekeeper.

2. The delay of yard departments in furnishing the general storekeeper with manufacture invoices of articles made in the yard: Would that this part of the prize essay could be hammered in on the consciousness—yes, on the guilty consciences—of every head of a manufacturing department! After considerable experience in this direction, the commentator has no hesitation in asserting that these exasperating and efficiency-crippling delays, could be wholly eliminated by a little attention on the part of those who are responsible. What good is an article if one does not know the cost? "No good," replies the civilian; but for a naval officer the answer is not so decisive. A 14-inch block can be used on board ship, whether the general storekeeper through whom it is issued knows its value or not. But what of his books, what of his returns to the bureau, of the bureau's report to the secretary and the latter's to Congress? "Great oaks from little acorns grow," and the one hundred million dollars worth of "accounts" of the navy, are made up of a multiplicity of comparatively small items.

Not to put too fine a point on the matter, the fault lies with the "cost-of-work-man," in the manufacturing department concerned.

3. "The spirit of the regulations permits no storehouses in a navy yard, other than the general stores—and also directs that supplies be drawn from store—only in such quantities as necessary to keep the jobs going properly": There is no doubt what the regulations mean, but every general storekeeper knows of the existence of "private storehouses." Leaving powder aside, as a proper exception to the storehouse rule, what of structural steel? What of anchors and chains? What of blocks? What even of library books? It takes a specialist to handle and store powder—granted, freely granted. But it does not take a specialist to keep steel plates in a rack, nor to hang blocks from a line of hooks, nor to coil chain, nor (save the mark!) to dust off a row of books. Yet department hoarding places for all these things have recently existed in certain yards—for some of them still exist. The remedy is easy.

4. Inspection of purchased articles: The prize essay omits, no doubt as

appertaining to the use after issue rather than to the care and custody of stores, any reference to the final disposition of supplies. Speaking by the book, it is not the storekeeper's business what becomes of stores when once they have been issued on a properly approved stub-requisition. But, in a broader sense, it is his business to further all improvement in the use of material for which he originally "accounts." Therefore, the commentator hopes to live to see the day when industrial inspection will be in force in the navy. By this is meant a system of overseeing—by a *responsible man*—which will follow an article from its issue from the storehouse to its final disposition in the job of a manufacturing department. I hear an objector: "Why, we have this now—I know exactly where every article I draw goes to." Do you? Think again! As the prize essayist might say: "The Master Something guesses that Hiram allows as how that Rube reckons he mixed that last lot of venetian red"; but *you* do not *know* anything about it. Those one-thousand 16-candle powers you drew last month—are they all in the shops for which they were intended? The ten copper ingots—valuable stuff, sir—were the whole ten thrown into the melting pot? What really became of that 20-foot length of brass rod? Did you or any other really *responsible* man have time to see how much of that 5000 feet of ash went into those ship's cutters? Until there is an industrial inspection in the navy, "an inspection that inspects," there can be no such thing as economical storekeeping. The master-at-arms may keep the keys of the paint locker with jealous care, but what good does it do if "Tim Mahoney, topside," has bored a hole through the deck and is drawing off the alcohol from below? Surely the expenditure of shellac will increase.

Paymaster CHAS. CONARD.—Mr. Mudd has recommended that the naval supply fund be enlarged by turning over to it at a set date (preferably the end of the fiscal year) all "common general stock." This means that all stock bought from annual appropriations should, on June 30, have its ascertained value credited to the naval supply fund. Of course, all material purchased for a definite purpose, *and not out of annual appropriations for stock* would be omitted from this transfer. Let us examine this move, as to its advantages and disadvantages for securing the end in view, *i. e.*, increase of the naval supply fund and its consequent admitted benefits.

Mr. Mudd says:

"Bear in mind that the yearly general appropriations are intended for the support of the navy for *one year*. If Congress gives money for building ships, procuring reserve guns and ammunition, etc., the appropriations are separate items in the naval bill. The regular annual bureau appropriations have not been intended by Congress for use in storing vast quantities of reserve supplies at the yards. They have been used for such purpose, though, towards the end of the fiscal year, with large balances on hand. This waste or tying up of government money has done the navy, as a whole, more harm than it has done good to the individual bureaus who have thought to gain an advantage. This useless stocking up is an old, familiar subject in the naval committee rooms at the Capitol.

"If this idea for enlarging the naval supply fund should ever be considered by the department, it is hoped it will not be opposed by the technical bureaus for the reason alone that they do not want to pay a second time for the supplies originally bought under their regular appropriations. What they really will be paying for is a sane, efficient system of storekeeping from which, in the end, they are certain to benefit immensely. And they should reason that the sacrifice, if any, is necessary on account of sins of the past, which now make Congress say 'nay, nay,' when we knock at the door with our request for a money allotment increasing the fund."

The objection which immediately presents itself to the mind of anyone considering this scheme of investing the naval supply fund with the value of all common general stock at the end of the fiscal year, is, that material bought from one annual appropriation and remaining unused at the end of that year, would have to be again paid for by the succeeding annual appropriation. Mr. Mudd refers to this, and hopes that this paying a second time will not influence the technical bureaus to oppose the scheme. In his opinion the necessary sacrifice will be more than offset by the benefits to be gained. But is there any sacrifice involved? I propose to show that there is not. A concrete example may throw a little light upon this matter.

Suppose the appropriation "Equipment of Vessels, 1907" has accumulated stores to the value of $10,000 in excess of its needs for the current year, and that these stores on July 1, 1907, become common general stock. The succeeding appropriation "Equipment of Vessels, 1908" will then have the benefit of these stores, and will use them without charge to itself. During the course of the fiscal year 1908 more stores are purchased from the second-named appropriation, and at the end of that year there will again be a balance of material on hand, since it is not probable that all stores bought during the year would be issued—in fact, it would be very undesirable to end the fiscal year with no reserve stock on hand. It is fair to assume that the balance of equipment stock on hand at the end of the fiscal year 1908 would at least be equal to the amount on hand at the end of the fiscal year 1907; as a matter of fact, judging by the experience of past years, it would exceed such amount. For the sake of argument, say that the two balances are equal. Then it is clear that, although the appropriation "Equipment of Vessels, 1908" started the year with $10,000 worth of "free" stock, it has to be charged wth an equal amount which constitutes the reserve or "free" stock for the succeeding fiscal year.

Now, if at the end of the fiscal year 1907, that $10,000 worth of stock should be turned over to the naval supply fund, it is true that "Equipment of Vessels, 1908" would be charged with the material as it is used. But, as the value charged to that appropriation and credited to naval supply fund is immediately used for the purchase of more stock, the appropriation "Equipment of Vessels, 1908" will not be under the necessity of providing a new reserve, or "free" stock for the succeeding fiscal year. In other words, the appropriation named will be charged with the exact value of stores drawn for use, *and no more*. It neither has the benefit of

common general stock itself nor does it have to provide common general stock for the next year. Consequently, it gains exactly what it loses.

It is confidently believed that this idea, once fully comprehended, will remove all objections to the scheme which are founded upon the fear of "paying twice" for the same stock.

It would appear to be reasonable, and in accordance with the intent of Congress, that all material purchased from an annual appropriation should at the end of a fiscal year be turned over to a specially designated fund, in the same manner that all unused money is turned back into the treasury, under "Miscellaneous Receipts." Starting with each fiscal year, any given appropriation would then be charged with the exact value of material it uses during that year. There would be no "common general stock" and consequently material could not be used without a charge being placed against the appropriation concerned. The naval supply fund, being of sufficient volume, would supply all the stock needed for use, and no appropriation could be utilized to procure material which might be in excess of the needs for the year in question, as each appropriation would be charged only when the material was drawn out for use.

The advantages to be secured, through increased efficiency and economy, by the institution of an enlarged naval supply fund are admitted by all who have given the subject more than superficial consideration. It may be classed as a self-evident proposition that one common source from which all stores may be obtained by those intending to use them would be superior to our present system of scattered stock, stored and issued under varying conditions and under regulations so complicated that only a few experts are qualified to comprehend them.

Naval Constructor T. G. ROBERTS, U. S. Navy.—It is gratifying to note that a staff officer has been awarded the first prize, which speaks well for the fair-mindedness of the board; and since the Board of Control must have been able to discern, from the context, who the author was, the award no doubt indicates, aside from the merits of the paper, an appreciation of the well-known good work done by the author in this line of business during the past several years. Certainly it has been a most difficult task, and if the storehouse system deserves criticism, it is because of the system itself, and not the individuals who have been struggling with it. The system, as it stands, has been sufficiently condemned, even by the author, and the problem now is to reform it so that it will work satisfactorily. I have previously expressed my views upon this subject, which remain unchanged, and anything I may add can be only by elaboration to meet the new phases presented in this paper; and if I differ from the author more radically than heretofore, it is in proportion to the quantity of literature now presented. My views and arguments are quite impersonal, but I shall take the liberty of using the author's statements in such a way as to put them to the test merely to emphasize my own conviction that the reform herein offered will not cure the evils herein described.

After a convincing description of some of the inadequacies of the system, the author proposes to reform the naval supply fund, first by transferring all supplies into it, and second by flooding its treasury with millions of

dollars so that it will be so bountiful and prosperous that it will ultimately become successful. I dare say there is no business or individual so poor or so improvident but that it would threaten to declare a dividend if somebody would come along and give it plenty of money. It goes without saying that if you buy enough supplies to fill the storehouses with every conceivable material, the technical departments will be able to get what they need without complaints; and if that be the ultimate desideratum from he government's viewpoint, then why not increase the fund to fifty instead of eleven millions? The objections are that the larger the stock the greater the overstocking, and the greater the leakage of missing stores with the proportionately smaller chances of locating leaks. I have heretofore fully described, in these pages, the possibilities in these directions. "But," the author says, "here is a great reform, it is marvelous, simply wonderful, or will be after it gets reformed twice. So come, Mr. Technos, and volunteer to put into execution my great reform, else 'it is unpatriotic.' Then Congress is *certain* to notice it (Congress is so sensitive to notice) and after saying 'Larks me!' will give it a second dose of reform by voting it rich." This proposition will serve to illustrate the universal modus operandi of the typical Mr. Keepstores.[1] He says, "Here, Mr. Technos, I am going to do something; please make out the papers in quadruplicate according to this handbook of rules, and say, old man, you do it!" The storehouse system is charged by law and regulation with the purchase and safekeeping of stores. Does it perform these functions? If not, how much of it is done by the technical departments by rules and regulations which nobody else but the storehouse system prescribes? Mr. Keepstores says to Mr. Technos, "Here, you make the requisitions, you make the list of naval supply fund stores to be kept in stock, you get the quotations from the business firms, you receive the goods, you handle them, and haul them, and store them, and issue them to yourself, you notify me when you have done so, and you make out the papers and send them to me so that I may copy them or forward them. You inspect the goods, you survey them, you appraise them, you determine the disposition of them, you certify to proprietary articles, you recommend awards of contract, you explain why nobody would bid within your estimate, you certify to damage caused by delays in delivery, you prepare or modify the standard specifications, you do everything that has any responsibilty attached to it, and I'll handle the papers. I will make the rules, you execute them. You have castigated my system, now I will reform, you do it. You volunteer to turn your supplies into the naval supply fund for the sake of example, which will make more papers and will leave nobody responsible for anything, which is the only certainty about it." So saith Mr. Keepstores to Mr. Technos.

A certain paymaster general testified before the Naval Committee, not

[1] In this discussion I use the terms "Technos" and "Keepstores" impersonally, as representing the respective attitudes of the technical department and the storehouse system in their actual working relations, for which neither are responsible, each exerting his best effort under the laws of business and of human nature.

many years ago, that whenever he tried to accomplish any improvement in this business he met with the opposition of the other bureaus, and was powerless to act.

Here is Mr. Gulliver Keepstores bound helpless by the Lilliputs, with a hundred tape ribbons, each one labeled "My work, you do it!" Now, I am not finding fault with the storekeeper because the system is such that he cannot afford to commit an act involving responsibility where a technical department can go behind his action and reverse it. Far from it. Yet almost all his business is so arranged. The author states on page 21 "that a general storekeeper . . . . really respects himself more than he does portions of the regulated law." What else can he do but pass the question to the technical department for it to answer? In order to get this action a case must be made out on paper, as it has to be sent around through military channels to Mr. Technos, or Messrs. Technos, as the case may be, for unless it possesses the stamp of the commander-in-chief, it has no authority in being. One copy must be made for every department or office, and one for every bureau whose business is involved; that is the general rule by which to determine the total number of copies. If the paper is in the shape of correspondence it must be copied by each office or department that handles it, else whose fault will it be in case of a miscarriage? So, each one completes his case and keeps copies of all papers to show that his own sheets are clear. There is your red tape.

While a storekeeper would hesitate to commit a responsibility in behalf of a yard department he is not so reticent about making volumes of rules, which the other fellow has to conform to, and if the rules will not work it is the other fellow's fault, of course. He would even reform by making a regulation so formed as to secure the punishment of the other fellow. A case in point occurs in a discussion of Paymaster Conard on page 124 of the March number of this publication, where he says, "Where emergency requisitions are made necessary by the fault of some one concerned, the proper procedure would seem to be to punish that individual for his fault in a fitting manner," etc. I would like to see you catch a general storekeeper under that clause. It is not *his* fault if the requisition (4 to 15 copies) is delayed in the making, as he does not make it. He forwards the papers, and it does not take him long to retain copies for his own files including enough to cut up for pasting upon inspection calls at a later date. You cannot catch him there. It is not *his* fault if the contractor does not deliver on time. He can probably show you a copy of the letter he wrote the contractor urging haste. When the goods arrive it is not *his* fault that the captain of the yard orders them hauled by Mr. Technos clear of the water front. It is not *his* fault if the contractor delays sending the bill so he can copy it on the inspection call, and of course he cannot divert his clerks from their legitimate paper work inside the storehouse to take up a delivery of materials upon arrival and issue a call immediately in advance of having the contractor's bill to copy from. See Chapter something, Art. somewhere, Navy Reg's. Never touched him. It is not *his* fault if the Board of Inspection delays the papers in order to re-handle or re-weigh or count or measure the stuff in its regular turn. No, it is not his

fault, and he can prove it by the papers. It is the fault of the contractor for delay in delivery, or the fault of Mr. Technos for lack of foresight. In other words, when the thing does not work, here is the remedy: "My system, punish the other fellow." If Mr. Technos could project his foresight through the general storehouse jungles into any clear portion of the future, he might with propriety set up housekeeping as Elijah IV. No one can foresee clearly, either into or out of the naval supply fund or the general storehouse. A better regulated proposition than the above and one identical in effect would be to provide, by suitable legislation, that Mr. Technos should be punished quarterly for all delays in the delivery of goods that he raises a kick about.

As to the poor contractor, he has already been punished to death by another typical storekeeping reform movement of a few years ago, bearing the old familiar title "My reform, you do it." Mr. Contractor was penalized. He raised a kick. Then he was penalized provisionally, if and provided that the general storekeeper could get anybody else besides himself to certify that he should be penalized. "Here, brother Technos, you penalize him. You certify whether or not his delay has been damaging to the government interests." Of course, when it comes right down to business, Mr. Keepstores does not know whether or not a delay in the delivery of a yard department's goods is damaging or beneficial to the government interests, so he has to ask Mr. Technos to certify to it; but in a paper like this he can loop the loops with the government's whole interests and shunt Mr. Technos off upon the side-track of his own bureau's interests, with the reminder that "there is not as much reason for the existence of the other bureau as it might claim." Here is another one: "Yes, Mr. Zealous, you have protected your bureau all right while the general storekeeper was trying to protect the best interests of the service." That leads to the following enigma: If a general storkeeper has to ask Mr. Technos what deliveries of stores, occurring in his, the general storekeeper's work, are damaging to the service, where does he find out which portion of Mr. Technos' work is done in the worst interests of the service? If he has now, daily, to ask Mr. Technos which delivery is damaging to the service in order to carry out one of his own mighty reforms, wherein does he obtain information of the best interests of the whole government sufficiently to institute a new, triple-plated reform of the naval-supply-fund-you-do-it? And that leads us to the pith of the argument. Upon what basis does the storekeeper of a private shipyard establish rules which the manager of the works has to conform to? How much watching by the storekeeper will the manager stand, to assure success? Or is it that the storekeeper is working for the manager and not the vice versa? Of course that raises the question as to who is the manager.

Now let us see what the author thinks about it. "We accordingly learned to scrutinize *closely* our brothers' list, before ordering the goods." And again, "Ingenuity should be invoked towards discounting emergencies . . . . but these times should be reduced to genuine emergencies." Of course the author means that Mr. Keepstores should regulate Mr. Technos and reduce his emergencies to plus or minus zero. Now in order

to secure the proper management of Mr. Technos by Mr. Keepstores, the author urges that the officers of the supply department "take personal part" in their work, "but help do things." In the quantities of goods to be asked for "the general storekeeper should again have a personal hand." Here is food for thought.

Now let us examine in a more general way what the author thinks about the present condition of the general storekeeping system: "The . . . . system, although well equipped mentally, was born with a curse, that, although alleviated a little since birth, has not been cured. This deformity is the binding tissues to the bureau system of the Navy Department." Then, later, "So comes a little loss of respect for the best system of *general* storekeeping that can be devised with the present day facilities."

Then again he shows, "The chaos that this law would have brought about if administered as Congress must have intended," proving thereby the necessity for what he calls a regulated law, and then he says later, "And here comes up one of the most damning points of the system under the regulated law. All sorts of devices and subterfuges are resorted to by them in order to protect their stock from their brother vandals." That is, at "the great July robbery" when the stock of all departments becomes subject for general use just the same in effect as if they were transferred to the naval supply fund. The enigma here introduced is: If naval-supply-fundizing all supplies each July first is "one of the most damning points," how damning will it become if everybody should volunteer to naval-supply-fundize all their stock at once and for all time? How many more "devices" and "subterfuges" and "brother vandals" would that produce if no one could ever legally be permitted to count on any materials with certainty, at any time of the year?

Now what have we got out of this that is clearly established? We have this much: A law which, if administered as Congress must have intended, would have brought about chaos, hence the law was not followed; a regulated law was substituted, and under it occurs one of the most damning points of the system. Therefore, "a general storekeeper, who really respects himself more than he does portions of the regulated law" does not follow either the law or the regulated law, and "would not let a yard department take out of store supplies that had been purchased by another department for an expressed object of work." Here again is food for thought. If neither the law nor the regulated law nor the navy regulations govern, then really we may justly inquire, what is the storehouse system? Would it not be more accurate to call it the general storehouse lack-of-system?

If one navy yard violates the rules in one respect, another does so in a different respect, and each violation is governed by practical local considerations to meet the necessities of the technical departments. Though the storehouse system would not confess subordination to the technical departments for anything in the world, yet its work must subordinate itself to theirs in final resort, following the nature of things; and that is why a storekeeper must break his own rules to avoid taking responsibility of delaying work by issuing supplies, after July 1, to other departments, that

were bought by a particular department for a specified object—even though the law requires it; and though the responsibility for such a delay would be only a moral one, not fixable upon any one else, yet the index finger would point accusingly towards his system if not towards him. But he would not shoulder even the moral responsibility. Hence, "the tail wags the dog." If a law can be passed preventing any one from ordering supplies for a specified work, but requiring him to order them under the naval supply fund for general purposes where anybody else may draw them out, then a general storekeeper can issue them to any one without taking a responsibility, and no one in particular can claim the goods. No doubt that a reformed naval supply fund, as advocated by the author, would be a relief for general storekeepers.

A short time ago in his previous paper, the author was advocating new legislation to facilitate the quick purchase of supplies by open-purchase requisition. He said on that subject "The present situation . . . . is almost intolerable." "Even under the change of law there would continue to be bought by advertisement and under formal contracts the great bulk of naval supply stores." In discussion I said, "If you wish to reduce the stock in naval supply fund, amend the laws so as to provide purchase at short notice. Otherwise, under the present arrangements, Congress should appropriate more money for a larger stock in naval supply fund." Since then a law has been passed facilitating the more rapid purchase of goods. The author seems to forget this altogether and does not touch upon its effect on the system. His position now is that *both* rapid purchase and a large supply fund are necessary. Having obtained the one he now proposes to convert it to the other, as he says "The bureaus should not be allowed to purchase under their appropriations . . . . In emergencies . . . . purchase in the open market should be made under the fund." Does he mean that rapid open purchase under the new law will make any reform in the paper work by writing "Naval Supply Fund" in lieu of some other bureau appropriation at the top of the requisition? Does he mean that the requisition will be in duplicate instead of four to fifteen copies, to obtain the advantages he pictures? Does he mean that the general storekeeper will prepare these requisitions instead of the technical departments as heretofore? I think not. In fact, there cannot be any material difference between the two ways—the general storekeeper would only have to transfer, by paper work, the charges from the fund to the bureau appropriation when the goods are drawn out. It is only a matter of juggling papers. Goods needed at long range would be ordered in naval supply fund by letter request, in duplicate, and purchased by advertisement as heretofore. Short range goods would be obtained by requisition in numerous copies precisely as heretofore in every detail, excepting in the words "Naval Supply Fund" written at the top. In other words, there is no difference at all.

The author says that the technical bureaus should not oppose the scheme of enlarging the naval supply fund because "What they really will be paying for is a sane, efficient system of storekeeping, from which, in the end, they are certain to benefit immensely." Then later he refers to the

system as "The best system of *general* storekeeping that can be devised with the present day facilities." Then, reassuringly, "The bookkeeping and accounting in a general storekeeper's office are simple affairs, in spite of what may be generally thought." If a description of the system is contradictory, so is the system itself.

The essayist proposes a reform on page 14 wherein, after assuming that heads of technical departments draw out quantities of stores not charged to specific job orders and are keeping sub-storehouses on the side, he proposes to take an inventory of these stores at the end of each fiscal year in the my-work-you-do-it way, thus "At the end of each fiscal year require the head of each department . . . . to submit an itemized list . . . . of material . . . . on hand in the department, ... lists to be transmitted by the commandant, first to the general storekeeper for examination and comment and then to the Bureau of Supplies and Accounts, through the bureau concerned." There is nothing in that proposition which a general storekeeper cannot do, even with his feet cocked up on the desk without "lending a personal hand." If I remember aright, a certain paymaster general testified before the Naval Committee not many years ago that it would take him three years to make an inventory of navy yard materials. Now here is a cheap way to get it in one year: Make the other fellow do it. I merely wish to emphasize the inconsistencies of the system as I go along. Now here is the most contradictory: Excepting those supplies drawn for current work the yard departments have no stores that are *drawn* from store. Drawn stores are those that have been covered by stub requisition, and charged to the yard department off the storekeeper's books, and for which the department has given receipts. The stores in the *possession* or on the premises of the yard departments are mostly undrawn stores, which remain on charge in the storekeeper's books and for which *he* is nominally responsible. When the storekeeper has not the storeroom or the vehicle to handle and store the goods, he *requires* the yard department to do it; and when the nature of the goods requires that they be stored near their logical point of use, the yard department again handles and stores. Thus, even the yard department's method of obtaining possession of stores is again illustrated by the adage "my work, you do it." On top of that, the author now herein proposes that the yard departments shall not only do the storekeeping of these stores, but shall make returns of them, not only by stub requisition for those used currently, but also annual inventories of balances on hand. Add to that the requirement that each department shall have possession of *all* its own stores, small as well as large, and you will thereby convert the *general* storekeeper into a fleet storekeeper pure and simple, and each yard department will become its own storekeeper officially as well as in fact.

I wish to pay my respects to the author's proposed reform in the delivery of goods, the analysis of which means, my-responsibility-you-take-it; thus, "On every printed schedule of supplies advertised for, in every contract, and in every open purchase order, there should appear something like the following: 'Deliveries at navy yards or stations must be made

as follows without expense to the government. If by truck, the articles will be delivered in the proper building of the yard, in such a manner that the doors at the receiving entrance may afterwards be closed. If by railway car, delivery will be considered complete by the placing of the loaded car in the yard. If by water, delivery will consist of placing the articles on the yard at the berth assigned to the carrying vessel.'" All right, why don't you do it? I'll tell you the reason: it is because no general specifications like that will fit every case. The party who would make such a specification will assume the responsibility for any impracticability in delivery that would be sure to turn up.[2] Hence, what is done instead? The responsibility is ultimately put upon the person who is going to receive the goods. Every head of department in every navy yard and station is required to make his own specifications governing the delivery of goods. In other words, "the tail wags the dog" if one may imagine the industrial department as the tail of the storehouse system; and I think the expression fittingly describes the whole system if we may consider that there are many tails each wagging separately in a disconnected, unharmonious way.

The essayist illustrates the naval supply fund by referring to one of the large yards as being the supply depot for some of the smaller yards. He cites an example of the failure of this source of supply and dubs it "Wrong!" Agreed. If more examples are needed I can supply them. Like finding the ball in Mr. Dooley's golf, it is a game where you send out an order for goods, and if you hear from it in time for anything, you win. The practice should not be encouraged.

The essayist's main proposition, however, is to transfer all purchases into the naval supply fund, then charge supplies out to the bureau appropriations as they are used; this, he says, will simplify paper work, and will place all supplies subject to be drawn by any department. Let us not forget, at this point, that the basis upon which this stock is accumulated is formed upon estimates or requests supplied to a general storekeeper by the yard departments covering their probable and actual needs. It is seen at once that there would be no requirements binding upon a general storekeeper which would prevent him from issuing to Dick and Harry goods

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[2] Since the above was written, the storekeeping system has been treated to a *real* advantage in the delivery of goods, an excellent step in the right direction. Heretofore, the contractor effected a complete delivery at uncertain places and conditions. Henceforth, the work and cost of handling at the yard will be lifted from the contractor and placed upon the government's shoulders, wherein Mr. Technos will handle, for the most part, his own goods. The gain in time will be valuable, but the greater gain will be in the confidence inspired in the contractor's breast, which will bear fruit in the reduced figures of his future bids.

The specifications adopted, though generalized as far as practicable, leave variations affecting the conditions at delivery to be prescribed in each requisition, subject to the local conditions, of course. They do not facilitate the handling and replacing of rejected goods.

that were ordered at the request of Tom for a certain work in hand. Therefore, you could hold neither Tom, Dick, Harry, nor Mr. Storekeeper responsible for a miscarriage. If such a course be desirable for simplifying papers, why not adopt the analogous one of having only a single naval appropriation covering both the *labor* and the *materials* of the industrial yard departments, denominated the "Naval Slush Fund," in lieu of the several bureau appropriations? Then all goods could be bought directly into this fund and wouldn't have to be charged out again. There is simplicity for you. The "slush fund" would, like the naval supply fund, be subject to the use of all the bureaus, and the poor friend would be as rich as the wealthy friend; the one would get the money and stores that got them first, and it would be nobody's fault if the ex-wealthy friend's work were held up for lack of funds or materials. This system would be successful only, provided Congress should vote it so rich that all hands together would not exhaust the supply. Such is the fallacy of the proposed naval supply fund.

I do not think the essayist has made out a case. If he should propose to leave the naval supply fund as it is, and to increase it gradually by a reasonable amount, he will find that proposition more practicable and in better shape for submitting to Congress; and many would be pleased, including myself, to see it brought about.

There is one note in the essayist's paper that is of the highest practical value and is worth more than anything else that can be done to improve the present system of navy yard administration—for it can easily be seen, through this paper, that the storehouse system extends in its ramifications throughout all the arteries of navy yard work—and that is in the motto, "All pull together."

The yard system, composed of many co-ordinate independent branches, operating under a passive management supplied mostly by cumbersome regulations that govern when convenient, may approximate nearest towards supplying an active management when all heads conspire together each to aid the work of the other as far as his jurisdiction and the circumstances will permit. When one sits on his dignity because the rules do not specifically require him to throw out the life line towards another fellow's work, he is sure to let a government interest suffer. Harmony in business matters is the watchword, and its most important place is between the large departments and the general storekeeper, whose operations are so mutually interdependent. In my own view none have operated in better harmony than the general storekeeper and the "wealthy and powerful friend" of page 18, and I can suggest no improvement in the storekeeping personnel. All individuals in the system are human and one cannot reform them or dispense with them, but one may so model his administrative system and methods as to place each individual at his best, and if he succeeds in doing that he will be entitled to the highest reward.

What the yard storehouse system needs is to be consolidated with its working mates under an active management.

Battle Rehearsals.

(SEE No. 121.)

Rear-Admiral C. F. GOODRICH, U. S. Navy.—To read such an essay as Lieut.-Commander Stirling's is both a real pleasure and a source of great encouragement. Whether or not one agrees with him as to details is a matter of little consequence; the dominating fact remains that our navy is waking up to the tardy recognition of its own weakness, and that ingenious minds are seeking the means of its strengthening. It is something to have diagnosed the case even if the medicine prescribed does not suit all constitutions.

The subject of the essay appeals with much force to me, for, long ago, I perceived these things, viz.: that our material was fairly satisfactory in the main, although susceptible of improvement in some particulars; that our enlisted personnel and our subordinate officers were trained to a degree of efficiency which leaves little or nothing to be desired; but that our captains and flag officers in too many instances were distinctly lacking in that skill which comes from natural ability combined with experience. It is a truism to aver that, no matter what a man's inborn capacity, he cannot handle a battleship, a squadron or a fleet without much practice.

Recent good work in Caribbean and Asiatic waters hold out the promise of improvement in these respects, but I am unreservedly of the opinion that we have unconsciously skipped an essential step in our education. It may be truly said that, afloat, we must have the school of the seaman, the school of the officer, the school of the captain, the school of the squadron commander, and the school of the fleet commander, if we would win battles. Of these, the primary and grammar schools, so to speak, have long been established, and they have produced wonderful and most cheering results, but I am unaware of a school of the captain and I believe that the school of the squadron and fleet commanders has held but few sessions. In a sense, this last is right, for until our captains have been put through a course of training which shall give them complete confidence in themselves and in their ships and entire mastery of their command at all speeds and under all circumstances so that they can move rapidly, fearlessly and safely, singly and in formation, it is not only idle but it may be dangerous to engage them in battle tactics at high speed. Such a scheme of maneuvers by individual vessels can be readily framed; indeed, at least one is in existence already. It would, if adopted, work great benefit; directly, in educating those who have the requisite nerve and pluck, the sailor's eye and habit, so to speak; indirectly, it would weed out those who are "ship shy" or lubberly.

Give us this school first and then the author's rehearsals will be with actors who have "learned their lines," not with amateurs stalking aimlessly about the stage and reading their parts out of a book.

As I doubt the possibility of signals run up to a yard-arm in battle, I question the desirability of introducing shapes as another means of conveying orders.

I like Mr. Dinger's conning tower, Mr. Stirling's dotter of fire-control,

and his definition of duties of the executive officer. To the responsibility of the navigator, I would add that of keeping clear of the next vessel ahead. Finally, I desire to express my thanks to the writer for an essay that has greatly interested me and that will inevitably help the navy to fulfill that mission which is its only reason of existence.

Naval Constructor T. G. ROBERTS, U. S. Navy.—Those who are engaged in improving the fighting qualities of the fleet have advocated that new legislation should provide for commanding officers who shall be well trained in the duties of their positions. Whatever the need in this direction, it is more important that the persons of the commanding officers of fleets, squadrons, and ships, and the succession to command, should be protected in time of battle. As in any business the difference between failure and success lies mostly in the managment, so in battle every safeguard should be utilized to protect the management from sudden derangement by the loss of a commanding officer. To swap horses while crossing a stream is as bad policy now as it ever was, and the government should take no chances. Though the memory of Farragut in the rigging still abides with the living, yet his methods and fighting equipment are very far removed. The proper place for commanding officers nowadays is behind armor.

The Naval Profession.

(SEE NO. 122.)

Commander B. A. FISKE, U. S. Navy.—My attention has been called to my omission of the name of Admiral Stockton, in mentioning those who were friends of the War College, in its days of struggle, when it needed friends. I regret the omission; for Admiral Stockton's name should have been included, even in so small a list. The list, however, was intended to be merely indicative, not comprehensive.

Commander W. I. CHAMBERS, U. S. Navy.—I think Commander Fiske is to be congratulated on having written one of the best essays ever produced by the Naval Institute. This one deserves a prize. It contains so much that is worthy of commendation and is so logically presented that even if some of its sentences be adversely criticised the beauty of the whole cannot be impaired.

Concerning the "Importance of Wealth," he says, "How utterly impossible it is for even the bravest nation possessing naturally the most warlike ability, to contend successfully with a nation more wealthy and intelligent." I fancy he would wish to modify that expression. An exaggerated idea of the military power of wealth and intelligence is one of our chief stumbling blocks to the achievement of "preparedness." There are many examples in history to show that mere wealth is frequently the source of a nation's degeneration, and that the egotism of misdirected intelligence may tend to make a nation careless in guarding against the acquisition of a train of subtle germs beginning with effeminacy and ending with weakness and disintegration.

That splendid paragraph, on page 493, giving a rational view of the "victories of peace" shows that the essayist did not intend the above quoted sentence to remain unqualified.

The advantages of the *sunward* position, that is given such a prominent place in the essay, do not impress me to the same extent. An almost perfect remedy for sun-glare is provided by shade glasses such as are fitted to the late prismatic binoculars of Warner and Swazey. This impression I have gained by using such glasses, frequently, while navigating into harbor directly into the sun-glare of early morning. Of course our telescopic sights and all of our observing glasses should be carefully fitted in this respect.

In regard to using glasses and telescopic sights to windward during wet or rainy weather, there are certain transparent preparations, furnished by optical firms, to rub on the object glasses, that modify the inconvenience greatly.

But such questions are matters of investigation or experiment and this thought brings me to record my hearty agreement with the essayist in his "proposed remedy" as one of the aids in enabling us to avoid backwardness or mistakes in design. The utilization of the ship that I now command for certain important ordnance and construction experiments, during the past winter, is a hopeful sign. Some of the monitors can very well be spared for such work, especially during the winter months, and I hope the practice will be continued.

In regard to the influence of gun smoke, as well as coal smoke, upon the choice of positions between two opposing fleets, the following thoughts occur to me. 1. If one fleet be directly to windward of another the smoke will annoy both fleets about equally, assuming that both use smokeless powder. 2. If the windward fleet possess and use numerous quick-firing guns it will create a gun smoke screen that may place it at a disadvantage. 3. If a faster fleet maneuver for the windward position by running on the arc of a circle of greater radius than that used by the slower fleet, the outer or faster fleet may have to pass through a position with the wind on its bows, where its own coal and gun smoke will obscure and annoy all of its own ships, except the leaders. The leaders will then be exposed to the unobstructed and concentrated fire of the whole leeward fleet. 4. If both fleets be steaming direct to windward on parallel courses, the rear vessels of each column will be annoyed by the smoke and the gun smoke will annoy most the fleet that is firing most rapidly.

After a few maneuvers by opposing divisions of our fleet, valuable data will doubtless be gathered regarding the bearing that this smoke nuisance may have upon our tactics and designs, but we should always keep in mind the desirability and possibility of doing away with the annoyance of coal smoke in the development of future designs. Nevertheless, we may yet find it advantageous to possess the means on board of creating and controlling a gun smoke screen, for the purpose of covering a contemplated movement or a torpedo boat attack. This seems easy of accomplishment.

I should like to add to the essayist's closing sentence, the following: If you wish to get ahead or to *lead* the procession, make your own experiments. Satisfy yourself by original investigation.

Professor PHILIP R. ALGER, U. S. Navy.—No naval officer can read this essay without learning something from it, and no naval officer with a real interest in his profession can afford not to read it carefully.

Subjects discussed by Commander Fiske—and he lets few go without mention,—are seen under a new light, even when one does not agree with his conclusions.

In regard to one matter which he discusses at some length, namely, the relative value of speed for battleships, I think he, in common with most others, greatly underestimates the increase of offensive and defensive power which could be obtained at the sacrifice of a knot or two. I am almost inclined to believe that a single battleship of 16,000 tons displacement and say 16 knots speed, *if designed to that end*, could whip two ships of the same displacement in which armor and armament had been sacrificed to give 19 knots speed.

Captain W. W. KIMBALL, U. S. Navy.—Commander Fiske's paper on "The Naval Profession" is disturbing and useless.

He cites some facts that we of the service take no interest in, and draws certain deductions that will not be considered for at least ten years, and, therefore, need not have been drawn.

His proposed remedy for what he considers our undue slowness in adopting new ideas (his proposed establishing of an experimental station for the whole navy) is utterly impracticable.

Under the scheme many new devices would be submitted to his experimental department for trial and development which, if adopted for the service, would come under the cognizance of two or more bureaus with different degrees of financial responsibility for the total expense of the device, including the cost of experimentation and development, in each separate bureau.

How does Commander Fiske propose to arrange for the payment of the expenses of such experiments and developments?

On what forms would he make his requisitions?

How could he possibly prepare correct vouchers that would show the proper amount expended for each bureau?

The proposition is absurd.

But granting for the sake of argument, that an experimental department might be established, what would be the inevitable result?

A lot of gim-cracks would be forced on the service that we would be far more comfortable without and which, under our present methods, would be kept out of the way.

Take the Haessler breech plug as a concrete example: It was brought out six or seven years ago, taken to the proving ground, tested and rejected. To be sure, the thing worked all right and the rapidity of fire it gave from an 8-inch gun was something abnormal and disturbing, while the attractiveness of a continuous screw thread over a cut one was apparent; but it was supposed that the pitch of the thread might be too great or that the latch holding against a possible rotating action of the charge might be too weak, and so we were rid of the device for a long time.

Up to the present only one navy has regularly applied it in service, and it will be at least five years before all navies adopt it so that it will come to us in the natural and regular way, and in the proper stage of development—the obsolescent in contradistinction to the experimental.

Had Commander Fiske's proposed experimental department been in existence that plug might have been developed and forced on us a dozen years ahead of its appropriate time.

There are hundreds of such cases.

As a matter of fact, a much more practical idea than Commander Fiske's of an experimental department—*i. e.*, an experimental station for a single bureau—has been tried and rejected.

A generation ago an experimental battery was established for the forwarding of research in ordnance, especially in ballistics. It was a small affair with a very modest plant, but it was so arranged that it was far and away superior to any establishment in the world in the matters of getting the greatest amount of data from a single shot, and of getting the data with accuracy.

Quite a lot of experiments were made and quite a lot of figures were collected, all to no effect because they interfered with proofs and tests, and so the place was changed to a proving ground where tests could be made to prove that a new device was not perfect and proofs could be given to show the soundness of a preconceived opinion, both of which would be sadly interfered with by experimentation and development.

Tests of new devices are much more convincing than experiments with them. These latter lead toward the development of the devices to accomplish what they were intended to effect, while tests can be made to show that they are worthless because they cannot effect what they were never intended to. As for example, the first magazine guns with bolt closures were experimented with to develop their adaptability to handle service ammunition and found practicable in that regard; they were tested in the field in the hands of troops and found to be utterly impracticable as appears in many official reports, because the bolt closure did not insure a good alignment of pieces when the men were at support arms.

The inventors of those guns thought the manual should be adapted to the piece instead of the piece to the manual and would never have learned better in Commander Fiske's proposed experimental department, while a simple test showed their error at once, and kept the bolt closure out of the way for some time.

Again experimentation often leads to doubt or to holding a decision in abeyance when we want positive proof of the virtue of a thing that only proof will give.

In the early days of R. F. small caliber guns our powders did not give velocities quite as good as foreign powders when using the cartridge case as a charge measure. So the projectile was removed from the case and seated well forward in the chamber, and behind it was placed the case filled chock a block with powder—the space in the case used by foreigners for holding the projectile being used by us for powder—and thus a better velocity than any foreigner had obtained was recorded by us, a positive

proof was made that our velocity was the better, and the department was officially congratulated upon the result.

This could never have been done in an experimental department where weights and measurements and comparisons would simply have spoiled the proof.

There is no danger that an experimental department will give us trouble; for if one should by any chance be foisted upon the navy it would soon fall from its own weight or from the weight we could readily pile on it.

Lieutenant-Commander BEACH.—The chief value of the articles published in the NAVAL INSTITUTE PROCEEDINGS must be in the discussions and inquiries they produce.

Commander Fiske has touched upon many points of the naval profession. All will not agree with him perhaps, but certainly all who read what he has said must do much thinking.

Naval officers should be practiced in habits of thought and judgment upon strategy and tactics. But are either of these subjects practiced anywhere in our service, are either seriously studied anywhere except at the War College or in the Naval Institute?

We study the technical features of our profession at the Naval Academy and practice them later on board ship. But how about strategical and tactical questions? Is it only those who have had War College service that may be expected to be called upon if war happens?

There is not a page in Commander Fiske's Essay but what is full of meaning to the naval officer. A wide discussion of the matters he presents must be of value to every one of us. It is my belief that every officer should read carefully this essay. It is full of ideas for all of us.

The Old French Bronze Guns at the Virginia Military Institute and at the U. S. Naval Academy.

(SEE NO. 121.)

LIEUT.-COMMANDER E. L. BEACH, U. S. NAVY.

My dear Sir.—I have read with lively interest your recent paper on the old French bronze trophy guns. Let me assure you at the outset that I do not see how I can be of the slightest possible assistance to you in the prosecution of your further research into this interesting bit of history, for no pékin can hope to find things that elude the trained search of one in the armed service. However, your letter was sent to my department of the *Sun* and it just so happens that from a base widely severed from that on which you have been working I have devoted some little attention to French bronze pieces, and following my independent line of inquiry I was led to practically the same period of history as the point of distribution.

All through the South Seas and in the backwaters of the Malay archipelago in my various cruises I have made the acquaintance of an enormous quantity of old guns, both iron and bronze, a few Spanish and many French, ranging from 6 to 12-pounders, far the majority being 8 or 9-

pounders. Thus, your detailed sketch of *L'Envie* recalled many old memories. As between Malaysia and the South Seas the larger pieces are more frequent between Java and New Guinea.

The question as to how these pieces found their way out there was not difficult of settlement. Whalers and sandal wood traders loaded up with these guns as sure of a steady market in the islands and every such vessel sailing out of New Bedford and Salem carried these pieces among the ballast when bound out. This was no mere matter of inference, for when I first started in to explore those seas twenty-five years ago there were still to be found plenty of maroons and beachcombers who had jumped their ships and had ingratiated themselves with savage chiefs through ability to load and lay and point and fire these weapons. From the testimony of many such I gathered that almost all the heavy guns in these seas came originally from the two Massachusett's ports above mentioned. This connects these distant guns with those closer at hand which have been the subject of your study, their source is probably the same.

When the *Iroquois* turned up at Levuka, Ovalau, Fiji, in 1884, I remember that I took Commander (then Lieutenant) William F. Halsey around the Fijian towns for a little sight of the country and that in the course of our stroll, I think it was at the village of Vagadace a little to the north of Levuka, he observed and remarked upon two bronze pieces of French make.

Again, in the late '90s, when I was Consul-General in Samoa, I found a great many such guns in the native villages. Not only that, but I unearthed a beachcomber, named Coffin, a Nantucketer, of course, as the patronymic should prove, who had been practically sold with two of the guns to the chief of Solosolo, Upolu, by the skipper of the whaler on which he had shipped out of Nantucket. He told me that many of the guns had been on the islands for a generation when he came, but that his ship carried a large number with her, and after clearing from Nantucket had stood over to New Bedford expressly to buy them for the voyage. Here, as everywhere in the South Sea and in Malaysia, were these French bronze pieces. I showed several such to Captain Rasen, R. N., (H.B.M.S. *Royalist*) and in our discussions we reached the conclusion that they were the spoil of the war period recognized on this continent as the French and Indian wars. The prizes, of which there were many, were sold and that threw upon the market a large mass of cannon, for in that period the merchantmen went armed. The British foundries were working overtime to supply the need of the navy, the letters of marque could use only a small amount of the French prize, the remainder was thrown upon the market. In the North American colonies at that time there were no foundries which could manufacture such artillery and nothing could be more natural than to ship the pieces over in ballast for a market. At any rate it is clear that in the former half of the last century this country was filled with French guns. Your excellent suggestion of Lewisburg and the Canadian operations accounts for one source of supply. My own scanty investigations of the subject lead to the conclusion of the formation of trade depots of such artillery at Salem and New Bedford. Just how many such pieces at these two ports were available for whalers and sandal wood

traders we can only guess. I never kept any reckoning of the number of such pieces which I have found in the islands between the Marquesas and Sumatra, yet 1000 cannot be an overestimate when one reflects that I know of fully 30 at so insignificant a port as Apia.

WM. CHURCHILL,
Editor Questions and Answers, *N. Y. Sun;*
Formerly Consul-General, Apia, Samoa.

Gun Distribution Aboard Modern Battleships and its Influence on Naval Tactics.

(SEE No. 121.)

AN OFFICER.—In reading the article translated by Lieutenant-Commander Bryan and the notes by Professor Alger and Commander Fiske, the following points of disagreement have arisen in my mind:

P. 206. Do not understand first sentence. Should not "latter" read "former"? Author minimizes *dis*advantages of *latter* position.

Fail to see how bow presentation offers any *higher* target than broadside presentation. The height is same through 360° of presentation.

Consider waterline hole near bow *more* important than one on broadside, as it will affect both speed and handiness more.

Weakness of bow presentation defensively lies where it always lay—in the danger of being raked; of one lucky shot damaging several important parts. With the broadside presentation these must be taken one at a time, generally speaking.

P. 207. The author has just been speaking of "*large* changes of course." Under circumstances cannot admit last clause to be accurate. Such changes, coming suddenly as they would, would so affect lateral compensation of the enemy's fire as to cause him embarrassment that I should estimate nearly as great as that to the side making the turn.

P. 209. There *is* room, etc. But the next sentence implies incompetence in the enemy in permitting the faster fleet to get ahead, when slower himself. When faster himself, the enemy can ignore the other flagship at the rear if he can constrict the leading vessels by his speed.

Second paragraph. Can't see it. If C in C is out of formation to windward, the smoke of his own ships will lie between him and the enemy even more than if he were in the formation; if C in C is out of formation to leeward, he gets not only the enemy's smoke, which he would get anyway, but also the smoke of his own ships, which he would avoid if in formation. The idea of the C in C being out of the formation seems to me not well founded. I do not admit that the other ships of his command could see him (his signals) better. I wish the note had ended with the first sentence.

P. 214. Why is the faster fleet so persistently spoken of as "leading"? The author does not so speak. If the faster fleet is leading it must be running away, provided the slower fleet is properly handled, which must be assumed.

P. 223. Faster fleet "leading" again; why? The virtual (rather than effective) torpedo range of a fleeing (leading) ship is greater than that of a following ship. But on concentric courses, which is what I assume is meant by parallel courses, there should be *no* leading fleet, and hence no torpedo superiority due to "leading." The statement seems to me to have an ounce of truth and a pound of misstatement.

AUTHOR'S STATEMENTS.

P. 213, lines 4, 5, 6, and 7. This seems an excellent reason why the C in C should not be on either flank.

P. 213, lines 8 and 9 from bottom. The B-admiral may not accommodate the A-admiral in this particular. The author here seems to fall into the prevailing habit of assuming that the enemy will do the thing, or be in the place, that he, the A-admiral wants. Many a page of tactical trash has been written on such foundation.

Figs. 11 to 15, also 6, 7, 8, and 9. Why should any such approaches be considered, especially as the author assumes that scouts and lookouts have advised the admirals of the approach of the fleets? The statement of lines 5, 6 and 7, p. 218, do not cover this query, for the author has made both fleets approach in column. The truth of the statement itself is, however, plain enough.

P. 221, lines 4 and 11. The countermarch is a bad evolution. Togo's battle may be adduced to the contrary, but he had only four battleships, and so the evolution may be justified as he made it. But if he had had only battleships it seems to me beyond question that he would better have gone ships about.

PROFESSIONAL NOTES.

Prepared by Professor PHILIP R. ALGER, U. S. Navy.

SHIPS OF WAR, BUDGETS, AND PERSONNEL.

AUSTRIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Erzherzog Ferdinand-Max.	10,600	Trieste.	Building.
Ersatz Tegetthof	14,500	—	Projected.
Ersatz Kr.-Rudolf	14,500	—	"
Ersatz Kr.-Stephanie	14,500	—	"
Scout.			
Ersatz Zara	3,500	—	Projected.

The *Pester Lloyd* announces that the Superior Marine Commission has decided on an 18-000-ton battleship type, to be immediately begun in place of the three 14,500-ton ships first adopted.

BRAZIL.

Le Yacht states that Brazil has decided to order three 19,000-ton battleships in England; one will be built by Vickers' Sons & Maxim, and one, or perhaps two, by Armstrong, Whitworth & Co. They are to carry ten 12-inch guns and a secondary battery of 4.7-inch guns.

FRANCE.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Démocratie	14,865	Brest.	Under trial.
Justice	14,865	La Seyne.	" "
Vérité	14,865	Bordeaux.	Launched May 28, 1907.
Liberté	14,865	St. Nazaire.	Launched April 19, 1906.
Danton	18,350	Brest.	Ordered.
Mirabeau	18,350	Lorient.	"
Voltaire	18,350	Bordeaux.	"
Diderot	18,350	St. Nazaire.	"
Condorcet	18,350	"	"
Vergniaud	18,350	La Seyne.	"
Armored Cruisers.			
Ernest Rénan	13,644	St. Nazaire.	Launched April 9, 1906.
Jules Michelet	12,550	Lorient.	" Aug. 31, 1905.
Edgard Quinet	13,644	Brest.	Building.
Waldeck-Rousseau	13,644	Lorient.	"

NEW BATTLESHIPS.—*Le Yacht* gives the following as the characteristics of the six battleships of the *Danton* class: Length, 145 m.; beam, 25.65 m.; draft, 8.44 m.; displacement, 18,350 tons. Turbine machinery, with four

screws on separate shafts; 22,500 effective horsepower; estimated speed, 19 knots; radius of action at 10 knots, 8130 miles. A complete armor belt, 270 mm. thick, tapering to 200 mm. at the ends; 12-inch turret armor, 300 mm.; 9.5-inch turret armor, 220 mm.; conning-tower armor, 300 mm.; battery, four 12-inch guns in pairs in middle line turrets; twelve 9.5-inch guns in pairs in broadside turrets; sixteen 3-inch guns; eight 47-mm. guns; two broadside, under-water torpedo tubes. Estimated cost, 50,000,000 francs; estimated date of completion, 1910-1911.

NEW SUBMARINES AND SUBMERSIBLES AND DESTROYERS.—The Minister of Marine has ordered the commencement of 16 submarines, namely, 3 at Cherbourg, 7 at Rochefort, and 6 at Toulon. All are of the submersible type, similar to the 18 commenced in 1905. Their displacement is 398 tons; length, 51 m. 12 (167 feet); beam, 4 m. 97 (16 feet); draft of water, 3 m. 12 (10 feet). The maximum power of the motor is 700 H. P.; giving a surface speed of 12 knots; they will be fitted with 7 launching apparatus for torpedoes, and are to have a complement of 2 officers and 22 men.

The Minister of Marine has also issued orders for the commencement of four submersibles of much greater dimensions than those hitherto built; they are to be constructed in the Government dockyards: two at Cherbourg, one at Toulon, and one at Rochefort. The designs are not actually settled, but it is said they are not to be identical, and that the displacement will be about 800 tons, and length 70 meters; the surface speed is to be 15 knots, being 2 knots faster than all previous craft of this type, and the submerged speed will be 10 knots instead of 6 knots. Above all, the radius of action is to be far greater than hitherto attempted, namely, 2500 miles. The two to be built at Cherbourg are from the designs of MM. Hutter and Radiguer, the one at Toulon after M. Maurice's plans, and the one at Rochefort after M. Bourdelle's.

The contract has been signed for the construction of six destroyers by private firms, to be named *Hussard, Voltigeur, Tirailleur, Chasseur, Spahi,* and *Carabinier.* They are larger than those hitherto constructed for the French Navy, having a displacement of 400 tons, against a previous 330 tons, and will cost 2,000,000 francs (£80,000) each.—*United Service Institution.*

Trials of the *Victor Hugo* resulted as follows:

6 hours' consumption trial at 8,948 H. P. = 1.45 lb.
24 hours' consumption trial at 16,400 H. P. = 1.47 lb.
Full power consumption trial at 27,500 H. P. = 1.72 lb.

In the full-power trial she developed 28,427 indicated horsepower, and a speed of close on 23 knots.—*Engineer.*

At the beginning of May the French active squadron in the Mediterranean will be modified by the commissioning of the *Patrie,* while the *Carnot,* which has completed the squadron since the catastrophe to the *Iéna,* is to pass into the Reserve division; and the *Hoche,* which seemed an anachronism in the first line forces, will cease to be attached to them. Henceforth, therefore, the Mediterranean squadron will consist of four divisions, each of three battleships, the oldest being the *Brennus.* The first division will comprise the *Suffren, Patrie,* and *République* (18 knots); the second division the *Saint Louis, Gaulois,* and *Charlemagne* (18 knots); the third division the *Masséna, Jauréguiberry,* and *Bouvet* (17 knots); and the fourth division the *Brennus, Charles Martel,* and *Carnot* (17 knots). The first two divisions will be in full commission throughout the year, and the others for a part of the time with reduced complements. In December there will be a further change, owing to the expected commissioning of the *Justice, Liberté,* and *Démocratie,* which will form the first division. It is therefore hoped that next spring there will be five divisions of first-class

battleships, the speed being 17 knots as a minimum, with 19 knots as a maximum for some of the divisions. When the *Verité* is ready for commission there will also be one modern ship ready to take the place of any ship in the squadron requiring repairs. In addition to this powerful squadron there will be strong divisions of cruisers.—*Army and Navy Gazette.*

THE DESTRUCTION OF THE IENA.—A terrible explosion occurred about 1.30 p. m. on March 12 at Toulon on board the first-class battleship *Iéna*, which resulted in great loss of life and the partial, if not complete, destruction of this fine ship. The cause of the disaster has yet to be discovered, but it seems highly probable that it was due to the spontaneous explosion in the after magazine of what is known as B powder, a circumstance known to have been responsible for more than one disaster, including the explosions on board the battleship *Admiral Duperré* and the *Forbin*.

The ship at the time was lying in one of the docks, and was nearly ready to be floated out. It was some time before any one could approach the ill-fated vessel to render assistance, and a considerable time elapsed before it was found possible to flood the dock, when the fire was at last extinguished, after it had gutted nearly two-thirds of the ship.

The loss of life was very great, as it is stated that at least 118 officers and men have been killed, while a considerable number have been hurt, and others are still missing. Among the officers killed were Flag-Captain Adigard, Capitaine de Frégate Vertier, Chief of the Staff to Rear-Admiral Manceron, Lieutenant Thomas, and the chief engineer. Rear-Admiral Manceron is slightly wounded.

According to the testimony of the survivors, there was a first explosion followed by flames bursting from the after part of the ship, then a second, much more violent explosion, which ruptured the after part of the hull, scattered projectiles about, burst bulkheads, and created general destruction. One of the after magazines for the 10-cm. guns seems to have been the place of origin of the conflagration. Subsequent investigation shows that 111 charges for the 12-inch guns were burned up and that 1100 kilograms of black powder exploded.

Several commissions have already reported upon the disaster, but the most important one, composed of experts, has yet to be heard from. There is almost universal agreement that the fire originated in decomposing smokeless powder of the ether-alcohol gun-cotton type. The destructive results were largely due to the explosion of the black powder, and all the investigating committees agree in recommending that hereafter as little black powder as practicable be kept on board ship and that it be not stored with smokeless powders.

The following is an abstract of the official statement of the Minister of Marine, relative to the *Iéna* disaster (translated from the *Moniteur de la Flotte*):

Evidently the powder "B" is apt to disintegrate under the action of heat; and the change increases with the temperature.

It has been determined that powder heated to 110° C. (230° F.), during a certain number of hours, if it be still stable, may be heated to 40° C. (104° F.) during a number of months equal to the number of hours the test lasted. This duration greatly increases when the heating temperature is lowered to 35° C. (95° F.) and still more so, if the heating is intermittent.

According to the bureau of powders and saltpeters, the resistance of powder "B" is thus determined. Worked-over powders of six, seven, eight, ten, and even twelve years, if satisfactorily tested at 110° C. are held to be good, and can produce no accident.

All that I have stated applies both to new powders and to powders worked over, either French or foreign.

It follows that if a distinction is made between the new and the worked-over powders, and between the ammunition with a green band and am-

munition with an ordinary band, that distinction is more administrative than technical; and above all, is intended to indicate the origin of the lots. When the resistance test at 110 degrees has proved satisfactory, doubt is no longer possible.

This at least is the opinion of the bureau of powders.

Supervision of Powders.—Supervision or inspection consists in making an annual test of resistance to heat.

If we take the lots of powders which were on board the *Iéna*, which had been tested a few months previously, we find that none of those powders were in a condition making it advisable to remove them from the *Iéna*. Those having the least stability should have lasted at least 22 months, according to the rules of the bureau of powders and saltpeters.

The powders are withdrawn from the supplies when their resistance falls below 12 hours for a. m. powders—*i. e.*, the powders with amylic alcohol, which are the best—and below 20 hours for powders not a. m. They are issued for immediate use when their resistance is included between 6 and 12 hours for the powders a. m., and when between 12 and 20 hours for powders not a. m.

Let us now speak of the installation of the magazines of the *Iéna*. It is recognized that the decomposition of "B" powder is hastened by heat. Now, the temperature was not excessive in the magazines.

The various reports are explicit: The magazines of the *Iéna* are in a good condition.

At sea various observations are made. In the forward magazines, temperature is pretty high, not excessive, however, and lower than in the magazines of other vessels in the squadron. Aft, on the contrary, the magazines are cool, with two exceptions which are kept under observation. By the way, those two magazines did not explode.

As a rule, with the exception of two magazines aft which bore watching, the magazines of the *Iéna* were relatively cool. This was so true that the various captains of the *Iéna*—Captain Adigard himself—were minded of having those apparatus, so-called refrigerating, taken out of the vessel owing to their cumbersomeness and useless weight.

In 1905, July 10, Captain Bouxin, who commanded the *Iéna*, finding the magazines relatively cool and the refrigerating apparatus out of order requested that they be taken out.

When those propositions reached the department, I decided to have the refrigerators taken out. But immediately a study of electric ventilators was commenced. I wanted both operations to be simultaneous.

In 1906, Captain Adigard called attention to the taking out of the pressure regulators and the fixing of the fans, but he stated that the magazines were relatively cool.

He made no special proposition touching the shell rooms, which appeared to him to be in about a normal condition. Admiral Touchard when transmitting the reports of the general inspection, stated that the *Suffren* and *Iéna* were in excellent condition and only required some insignificant improvements.

The record of the temperatures of the magazines of the *Iéna* goes back to August, 1905. An examination of this record shows that temperatures exceeding 30° C. only existed in the magazines while the boilers were fired; it shows besides that since August 1, 1905, a temperature of 36.5° was reached but once, July 26, 1906, during the maneuvers, in magazine 6 of the 164.7 mm., which did not explode; the temperature of 36° was reached three times, on July 26 and 27, 1906, in magazine 7 of the 164.7 mm., which did not explode, and June 27, 1906, in magazine 8 of the 164.7 mm., which did not explode.

The temperature of 35.5° was reached once, July 24, 1906, in magazine No. 8 of the 164.7 mm. (unexploded), and in magazine No. 6 of the 100 mm., which exploded; the temperature of 35° was reached 17 times, but this happened before the last inspection of the ammunition. Besides I have

just reminded you of the formal rule: when the temperature of 30° is reached and lasts a certain time, the attention of the ordnance service is at once called to the fact, and it immediately proceeds to examine if the powders have undergone any change. If but once the temperature reaches 35° that service is to be notified; no such notification has been sent by the *Iéna* since the last annual inspection of the ammunition.

March 12, on the day of the explosion the highest temperature in the forward magazine of the 305 mm., which did not explode, was 21°; that in the magazine of the 47 mm. which was the highest reached, 23° (that magazine did not explode).

The mean temperature in the magazines of the 100 mm. which exploded varied during the latter days between 18° and 19°.

The temperature in the magazines of the 164.7 mm., none of which exploded, was 18.5°; the temperature in the after magazines of the 305 mm., which exploded, reached a maximum of 17°.

As a matter of fact, when a vessel is docked, with no pressure in the boilers, and the dynamos idle, temperature is lower than at sea; as a rule, between the outside temperature and that of the magazines, the difference is only two or three degrees for the hottest magazines.

The figures I have given show that temperature never rose to a point when it was imperative to notify the bureau of powders.

Report of Captain Adigard.—M. Michel mentioned a report of Captain Adigard which called attention to the danger of those powders. It is a fact, but this report did not reach the central administration, although there was no irregularity in this.

Captain Adigard, in his report, which was forwarded to the general staff of the squadron, stated that the *Iéna* contained powders older than six years, and he added that the moment powders become more than six years old, according to regulations, the central administration should be informed of the fact, and the powders replaced.

That report did not reach Paris because it was detained by the general staff of the squadron.

Here is the report and a note in pencil which intercepted it. It runs thus:

"Nothing to be done. From the fact that ammunition is six years old, it does not follow that it should be replaced if found satisfactory after being tested. I saw it again to-day. The responsibility of Captain A. is not concerned. To be put on file, No. —," *i. e.*, to be pigeon-holed.

That report was intercepted because contrary to Captain Adigard's supposition, if by the terms of the instructions of December 31, 1901, the powders over six years old should be reported, there is nothing in the prescriptions making it incumbent upon the bureaus to replace those powders on board vessels. Decision concerning those powders is based upon the results given at the time of the tests of the last inspection.

Powders six, eight, and ten years old should not be taken out of the vessels, if said powders proved satisfactory at the heat test.

This is the clear and absolute practice not only with us, but in foreign navies.

Accidents at Target Practice—Measures Taken—Sighting Telescopes.—I come now to the accidents at target practice. They assumed one of the three following forms: premature explosions, misfire, and hang fire; deformation of the cartridge case and difficulty of extraction.

Premature burstings had already taken place in the previous years on the *Suffren*, *Dupleix*, *Kleber* and *Desaix*, but always with cast shells charged with black powder; premature explosion presents no danger either to the piece or the gunner; it is only a wasted shot.

In order, however, to correct those regrettable incidents, I issued an order in 1905 that the cast shells should be tested before acceptance, with the shells set apart for tests, subjected to a pressure greater by 10 per cent than the service pressure. The 450 tested shells did not call for any

remark. We are therefore led to suppose that the accidents were due to an excessive sensitiveness of the priming mechanism, whose design prior to 1898—perhaps does not suit the actual velocities. Experiments are being conducted along that line.

As to the misfires, they are the results of the defects either of the plunger or the primer. We have given to the vessels the means of replacing the defective plungers, and ordered, since January 7, 1906, a periodical inspection of the primers, which had been overlooked up to that time.

I will mention in passing the proportion of accidents to the number of shots fired: 2 per cent for heavy and intermediate guns, 5 per cent for light ordnance. Besides, all those accidents were caused by old projectiles; and I wish on that point to indicate one of our most important reforms.

Before 1905, target practices, with one annual exception, were carried out with projectiles with reduced service charges. Since 1905, we have increased the exercises with full charges, in order to give our sailors more frequent training at battle ranges.

Now, by thus utilizing in target practice our real service projectiles, we prevent the accumulation of old projectiles, thereby avoiding risks of accidents.

Referring then to telescope sights: Two years ago no telescope was placed on any of our vessels. In 1905, my first act was to decide that the installation of the model in hand should be immediately begun, but to replace it later on by a better one, which soon made its appearance; this is the telescope of Commander Petit. At the present time, 74 of those instruments are installed in our Mediterranean fleet; 14 on board the school ships, 22 in our northern squadron.

All our new vessels will be provided with them. Besides, experiments with glasses of variable power and with range finders are being carried out.

What is Intended to be Done about Powders.—I would like to state briefly what we intend to do concerning powders. One first measure has been taken. The proximity of black powders and powders "B" constitutes, if not an actual, at least a probable danger; therefore, I decided to separate them.

In the battleships of the *Patrie* class, no magazine is in direct contact with any source of heat whatever.

In the *Ernest Rénan, Edgard Quinet, Waldeck-Rousseau* the magazines are ventilated by æro-refrigerating apparatus, in which the water is cooled by complete refrigerating apparatus.

In the *Jules Michelet*, all the bulkheads of the central magazines are fitted with a system of cold water circulation, and, in addition, æro-refrigerators are provided for cooling the air of the magazines.

Finally, in all those vessels have been installed ordinary non-conducting (of heat) casings.

In regard to vessels actually in service, we can and will endeavor to remedy as far as possible the material defects through a number of precautions in details by enforcing our preventive regulations. Thus the isolation of the sources of heat will be improved, refrigeration and ventilation will be practiced on the most extensive scale, under the special and permanent supervision of the commander.

Concerning the preservation of powders, the instructions of M. de Lanessan, bearing the date of December 30, 1901, are soon to be presented for a complete revision to the mixed committee on powder regulations. For the improvement of the powder in service, these are the measures which have been taken and are at present in force.

With time, powders "B" undergo slow changes, which are hastened through rise in temperature. More and more resisting types have been successfully studied and adopted. Since January 1, 1906, the type presenting the greatest safety (a. m. 8) is exclusively ordered from the bureau of powders.

From January 1, 1907, and in order to secure the complete homogeneousness of the lots of powders, the operation of remanufacturing has been replaced by rekneading, *i. e.*, the reconversion of the powder into mill cake, an absolutely safe operation.

I point out to you this important fact which was operative long before the disaster occurred. Finally, new conditions of manufacture and acceptance of service powders are being studied since October, 1905, by the Gavres committee as well as in the central laboratory.

The mixed committee on powder manufacture engaged in studying the new rules, will also seek to find out if it would not be possible for the bureau of powders and saltpeters to use a solvent better adapted to the conditions of service at sea, in the ammunition we order from it.

Along these lines, the bureau of naval ordnance continues to study as in the past, new types of powders, French as well as foreign, and tests have been made for several years and are still going on, of powders with added ingredients to increase stability and put on board vessels cruising in warm climates.

Towards the end of 1906, orders were given for nitrocellulose and nitroglycerine powders in order to compare them with ours, in regard to their lasting qualities as well as their ballistic power.

The navy has thus kept in close touch with the manufacture of powder abroad, and up to the present it has not been confronted by a single improvement not already realized by French manufacture.

As I have just stated, our intention is to appoint a purely technical board composed of many members, which will examine the question of powder in the army and navy and also if the system, perhaps even the monopoly (I leave all questions to be decided) should be maintained, and if reforms should not be introduced in the present organization.

GERMANY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Pommern	13,200	Stettin.	Launched Dec. 2, 1905.
Hannover	13,200	Danzig (Schichau Works).	" Sept. 26, 1905.
Schleswig-Holstein	13,200	Kiel.	" Dec. 17, 1906.
Schlesien	13,200	Danzig.	" May 28, 1906.
Ersatz Bayern	19,000	Wilhelmshaven.	Building.
" Sachsen	19,000	Bremen.	"
" Baden	19,000	Stettin (Vulcan Works).	"
" Würtemberg	19,000	Kiel (Germania Works).	"
Armored Cruisers.			
Gneisenau	11,600	Bremen.	Launched June 14, 1906.
Scharnhorst	11,600	Hamburg.	Under trial.
E	15,000	Kiel.	Building.
F	15,000	Bremen.	"
Protected Cruisers.			
Danzig	3,200	Danzig.	Under trial.
Königsberg	3,200	Kiel.	" "
Stuttgart	3,420	Danzig.	Launched Sept. 22, 1906.
Stettin	3,420	Stettin.	" March 7, 1907.
Nürnberg	3,420	Kiel.	" Aug. 28, 1906.
Ersatz Pfeil	3,500	Danzig.	Building.
" Komet	3,500	Hamburg.	"
" Greif	3,500	——	Authorized.
" Jagd	3,500	——	"

Le Yacht states that all the ships of the 1907-1908 budget will have turbine machinery. The armored cruiser *F* will have the Parsons type; the *Ersatz Greif* and *Jagd* either the *Rathenau* or the *Zaelli* type.

In a recent article upon the German navy in 1906, *Ueberall* had a good deal to say about the political aspects of the naval question. It did not tell us much about the causes for the delay in beginning the new battleships *Ersatz Bayern* and *Ersatz Sachsen* and the armored cruiser *E*, but the remark was made that the program had proceeded regularly and punctually until the time came for laying down these vessels. The present situation was that *Hannover, Pommern, Schlesien,* and *Schleswig-Holstein* had been launched, and were being pushed forward as rapidly as possible. But no battleship had been laid down, and the *Ersatz Bayern* and *Ersatz Sachsen* were upon paper. Of the armored cruisers, the *Gneisenau* and *Scharnhorst* were completed afloat, while upon the stocks or ordered to be laid down was the armored cruiser *E*. Of smaller cruisers, the *Danzig, Königsberg, Stuttgart,* and *Nürnberg* had been launched, while three cruisers, *Wacht, Komet,* and *Pfeil,* were under construction. No ships of the program of the present year had made any progress. As to the two torpedo divisions of 1906, they have been built by the firm at Schichau, and are destroyers of 540 tons and 30 knots. The Germania Yard is building *G137,* which is to be provided with Parsons turbines, and it is expected that she will displace 570 tons.—*Army and Navy Gazette.*

The small German cruiser *Danzig* on her trials made 22.96 knots with 12,114 indicated horsepower. She thus fell a trifle short of her designed speed. It is interesting to note that with most of these German cruisers those built by contract beat those constructed in the Imperial Dockyards.

The trial speeds obtained by this particular *Bremen* class—a series of vessels, by the way, to which we have no "reply"—were as follows:

	Speed, knots.	Builder.
Bremen	23.2	Weser, Bremen
Hamburg	23.1	Vulcan, Stettin
Berlin	23.2	Danzig Dockyard
Lübeck (turbines)	23.5	Vulcan, Stettin
München	23.4	Weser, Bremen
Leipzig	23.0	Weser, Bremen
Danzig	22.96	Danzig Dockyard

We have four Gems and eight Scouts, in a sense, as "replies," but the Scouts carry only 12-pounders, against the German 4-inch guns. Also, we are building no more such vessels, while Germany has nine 24 or 24.5 knot vessels of the same general type in hand.

The contract for the third German *Dreadnought,* the *Ersatz Baden,* has been secured by the Krupp Germania Yard at Kiel. The displacement of these ships is now stated to be 19,000 tons. The armament is sixteen 11-inch guns of 50 calibers each. Speed about 19 knots.—*Engineer.*

Le Yacht states that the armored cruiser *F* will be of 19,200 tons displacement and 25 knots speed. She will have Parsons turbines of 50,000 H. P., and her battery will consists of twelve 11-inch guns.

The building of larger battleships for the German Navy makes essential the widening of the Kiel Canal, the total cost of which will be more than £11,000,000, the work extending over seven or eight years. The charge will be borne by the Home Department, and will not affect the Navy estimates, though it is essentially for a naval purpose. In the current year a first instalment of £750,000 has been set down for the work, and some additional defences and fortifications are to be made at a cost of £100,000. The locks at the ends of the canal are to be reconstructed, and the waterway itself will be deepened from 9 meters to 11 meters (36 feet), while the breadth at the sill will be doubled, from 22 meters to 44 meters (144 feet 4 inches). It is also contemplated, in connection with the canal, to lay out a commercial harbor at Kiel.—*Army and Navy Gazette.*

GREAT BRITAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Bellerophon	18,550	Portsmouth.	Building.
Téméraire	18,550	Devonport.	"
Superb	18,550	Newcastle.	"
Lord Nelson	16,500	Jarrow (Palmer).	Launched Sept. 4, 1906.
Agamemnon	16,500	Glasgow (Beardmore).	Under trial.
Armored Cruisers.			
Minotaur	14,600	Devonport.	Launched June 6, 1906.
Shannon	14,600	Chatham.	" Sept. 20, 1906.
Defence	14,600	Pembroke.	" Apr. 27, 1907.
Invincible	17,250	Newcastle.	" Apr. 13, 1907.
Inflexible	17,250	Clydebank.	" Mch. 30, 1907.
Indomitable	17,250	Glasgow.	" Mar. 16, 1907.
Cruiser.			
Boadicea	3,300	Penbroke.	Authorized.

NAVY ESTIMATES, 1907-1908.—*Précis of Statement of First Lord of the Admiralty.*—The estimates presented to Parliament show a reduction of 1000 men, from 129,000 in 1906-1907 to 128,000 in 1907-1908, and a reduction of £1,427,091, from £31,869,500 to £30,442,409.

Personnel.—The changes in the establishment of the War Course College which have been in progress during the past year were completed in November, 1906, by the commissioning of H. M. S. *Terpsichore* at Portsmouth, as the headquarters of the War Course College, in command of Captain E. J. W. Slade, M. V. O., R. N., under whose superintendence the courses had previously been conducted. The War Course College as now constituted will be in the same position as the gunnery and torpedo establishments, and will rank among the fleet services and no longer among the purely educational services with which it was at first associated. In placing the headquarters of the War Course College at Portsmouth, care has been taken to provide for the continuance of modified courses at Devonport and Chatham, where lectures have been given on strategy, tactics, naval history, and international law and modern improvements in marine engineering, besides other naval and military subjects. One full course was held last year at Portsmouth, which was attended by 38 naval, marine, and military officers. The course which commenced in October has been attended by 40 officers. The full war course at headquarters has been extended to four months, and lectures were given during the course on the following subjects: Marine engineering, naval history, international law, tactics, trade, wireless telegraphy, organization of signal stations, armor plates and explosives, telegraph cables, mining, gun mountings, control of fire and effects of fire, combined operations and coast defence, battle practice.

Representations having been made that existing engineer officers under the orders promulgated since 1902 have not been given certain advantages which they had been led to expect at the time the new scheme of entry and training was promulgated, and it being also desirable to ascertain whether further instructions are necessary, with a view to the qualification of officers for duties with the Royal Marines under the new scheme, a committee consisting of executive, engineer, and marine officers has been appointed to consider the matter. Their enquiry has only just been completed, and their report has not yet been laid before the board. It is not, therefore, possible to indicate the nature of their recommendations.

The education of naval cadets under the system introduced in 1903 is making satisfactory progress. The first batch of cadets will complete their educational course on shore, and leave Dartmouth for training in a sea-going cruiser after next summer term. The most recent reports from the officers and masters at Dartmouth confirm in a remarkable way the anticipations formed of the present method of selection of candidates,

which has settled down from being a tentative experiment into a permanent system. The cost of the thorough education given at the two naval colleges obliges the Admiralty to call upon the parents for a substantial contribution towards it; but in the case of officers of the navy and army who can show that the fees paid are a serious burden, a large reduction is made in the charges. The question of finding means to extend this privilege of reduction of fees to such other parents as may need it deserves careful consideration. One exhibition for this purpose has already been provided through the generosity of a private donor. Possible county or other public authorities may be led to follow this example and that of the Argyll Fund, founded for the benefit of Scottish boys, and provide for naval cadets who belong to their several districts.

I have already stated that the number of men has been reduced by 1000. The present number of seamen borne is in excess of requirements, while the number of stokers is still less than is needed for manning the fleet. The entries of boys have therefore been continued at the same reduced total as last year, viz., 1500, and this has permitted of the entry of a large portion of the stokers required to make good the deficit. As the seamen drop to the required strength, the stokers will be increased. This process, however, takes time, as notwithstanding the popularity of the Royal Fleet Reserve, only a limited proportion of men can be allowed to take their transfer to the Reserve before the completion of their ordinary engagements.

The question of rating, advancement, and conditions of service of seamen and petty officers has been carefully reviewed during the year, and certain proposals, having for their principal object the improvement in the position and responsibility of the petty officer, are now under consideration with a view to their adoption in the course of the coming financial year. At the same time, it is proposed to establish a new rating of telegraphists for working the wireless telegraph instruments independently of the signal branch, which has hitherto conducted those duties.

From April 1 last a new system of training for the Royal Naval Reserve was introduced, its main features being the substitution of modern ships at the home ports for shore batteries as the place for carrying out drill and training. By the end of 1906 some 1300 men and 186 officers accepted service under the new system. Recruiting for the Royal Naval Reserve was reopened in November, and in the coming year it is proposed to enter 1000 seamen and stokers, 60 engine-room artificers, and 80 officers. The introduction of the gratuity of £50 after 20 years' service in lieu of pension at the age of 60 has been apparently much appreciated, as practically all the men who completed the necessary service since the first of April have elected to take the gratuity. The commanding officers of His Majesty's ships in which the Royal Naval Reserve men have been embarked for training report satisfactorily on the men; 530 seamen and 230 stokers have been embarked for training since April 1, 1906, in addition to the 587 stokers who served during the maneuvers, some of whom elected to count this service in lieu of their biennial training.

In the spring of 1906 some 120 of the 590 men forming the Newfoundland Reserve visited England during an extended cruise on board three of His Majesty's ships. The most favorable impression was created by their general appearance, and the commodore in command of the squadron reported in high terms as to their conduct and efficiency. Good reports are received from the colonies of the other branches of the Naval Reserve there established; and the Royal Naval Volunteer Reserve at home continues to justify the high expectations which were formed of this body when first raised three years ago.

As indicated in last year's statement, the training of boy artificers and mechanicians has been reorganized on the new lines—the former has been concentrated at Portsmouth and Chatham, and the latter at Devonport. The placing of these training establishments under the control of an inspecting captain has been attended by good results, and there is every

reason to believe that the scheme of training, now well established, will fulfil the expectations entertained by those who initiated the policy. Candidates of good qualifications are presenting themselves for training as mechanicians, and though a small proportion have had to be eliminated in the early stages of their training, the remainder have shown themselves fully competent to meet the demands of the instructors. It has not been possible yet to test the mechanicians who have been trained with a view to their undertaking duties in the engine-room, as the men who were put through the new course of training have only just been drafted to sea-going ships. The same may be said of the boy artificers. Those first entered have only just completed their four years' course, and arrangements are now being made for them to join ships for their first work as engine-room artificers of the fifth class. With one or two exceptions they have passed out of the training establishments with credit.

I am glad to be able to report a very striking increase in the improvement already begun under former administrations in the gunnery of the fleet. In battle practice, by which the gunnery organization of the ship as a whole is tested, and which is therefore the best criterion of efficiency, the average number of hits per ship in 1906 was practically double that of the previous year, although the conditions in the last year were considerably more difficult than before, the mean range being 1000 yards greater, and the time available for firing one minute less. In the test of gunlayers with heavy guns, which is a necessary preliminary to battle practice, but during which the efficiency of the gunlayers and guns' crews alone is tried, the average number of points obtained per man was 68.26 in 1905, as compared with 80.065 in 1906, or, comparing the percentage of hits to rounds fired, it was 56.58 against 71.12. In the test of gunlayers with light Q.F. guns the percentage of hits to rounds fired rose from 21.63 in 1905 to 34.53 in 1906. In the battle practice of the torpedo-boat destroyers there was a corresponding increase in efficiency, the percentage of hits to rounds fired being 20.02 in 1905 and 34.60 in 1906. It is particularly satisfactory that the improvement is general throughout the fleet, and not by any means confined to a picked selection of crack ships. The greatest credit is due to all the officers and men who have worked together to produce this result.

Shipbuilding and Repairs.—The new construction for the year will cost £8,100,000, as against £9,235,000 for 1906-7. It will include two or, unless an understanding between the naval powers be arrived at by the Hague Conference, three large armored vessels of the *Dreadnought* type. They will be of slightly larger displacement than the *Dreadnought*, and full advantage will be taken of experience of the *Dreadnought* in carrying out the details of their construction, motive power, and armament. One fast unarmored cruiser, five ocean-going destroyers, twelve first-class torpedo-boats, and twelve submarine-boats are also provided for.

£7,340,618 will be spent on the continuation of ships already begun; £759,382 in beginning new ships; of this, £107,100 will be devoted to the fast unarmored cruiser to be laid down at Pembroke; £307,482 on torpedo vessels and submarines; £344,800 on new large armored vessels.

Between April 1, 1906, and March 31, 1907, the following ships will have been completed and become available for service:

4 battleships (*Africa, Britannia, Hibernia, Dreadnought*).
3 armored cruisers (*Achilles, Cochrane, Natal*).
7 first-class torpedo-boats.
11 submarines.
Floating dock for submarines.

On April 1, 1907, there will be under construction:

5 battleships.
7 armored cruisers.
8 ocean-going torpedo-boat destroyers.
17 first-class torpedo-boats.
12 submarines.
1 royal yacht (*Alexandria*, expected to be ready in September next).

The strike on the Clyde will probably cause some delay in the completion of ships building in yards in that district.

H. M. S. *Dreadnought* was commissioned on December 11, 1906, 14 months after being first laid down. This remarkable achievement in shipbuilding reflects the greatest credit on all who were connected with the work, both at the Admiralty and at Portsmouth Dockyard. A certain amount of overtime had to be worked in order to produce this record, but there is no occasion to repeat it, and I do not intend to permit overtime to be worked in the yards in future, except in cases of pressing necessity, and then sanction on each occasion must be specially obtained.

The trials of the *Dreadnought* have given the highest satisfaction; she has completed more than 7000 miles at sea, and her passage from Gibraltar to Trinidad—a distance of 3400 miles—was accomplished at an average rate exceeding 17 knots an hour.

Distribution of the Fleet.—A further development of the redistribution of the fleet, in continuance of the policy instituted under Lord Selborne, and explained by him in his Memorandum of December 6, 1904, has recently been resolved upon by the Board of Admiralty. The redistribution of 1904 permitted of a sufficient concentration of *personnel* to man all fighting ships in home waters with nucleus crews, amounting to two-fifths of their full complement, and also to provide on shore at each home port a balance of men always ready to man two armored ships. The further distribution of naval strength now resolved upon will provide a considerable increase in all nucleus crews of ships in the first fighting line, and the complete manning of squadrons of six battleships and six armored cruisers which will not leave home waters. These twelve ships, together with forty-eight destroyers with full crews, some small cruisers, and the requisite auxiliaries, will be concentrated at the Nore, and will do their practices and sea service in the North Sea, and will be constantly ready for any emergency. The nucleus crew system will thus be maintained and strengthened in the constitution of the home fleet. The crews of the vessels at the other ports must fluctuate, according to the demands made for the provision of foreign reliefs and for other causes, but will not, except in the small cruisers, fall below three-fifths; more often there will be an excess over this number.

The term "in reserve" will no longer be applicable; all sea-going fighting vessels in the home ports, not belonging to other fleets or squadrons or appropriated for training purposes or local defence, belong to the home fleet, and will be able to complete to full crew at a few hours' notice. Certain vessels of older date have hitherto been described as "in special reserve"; in future such vessels will be kept fit for service and provided with crews sufficient to keep their machinery in good order and the ships ready for the duties required of them. I should explain that the home fleet is still in process of development, and that it will be some time before it can reach its full strength.

As the fleets at home will continue to be combined for war under the orders of the commander-in-chief of the Channel fleet, the Channel, Atlantic, and home fleets will carry out periodic peace exercises together under his command at such times and places as the Admiralty may direct. As indicated in the Admiralty Minute of October 23, 1906, the Fifth Cruiser squadron (the Nore division) of armored cruisers will be detached for exercises with the Channel and other fleets as desirable.

Considerable administrative improvement is expected to result from the organization of the home fleet. It has been necessary heretofore to deal separately with the distribution and arrangement of each of the existing reserve divisions. The position of the rear-admiral in command of torpedo craft and submarines has been somewhat anomalous, inasmuch as he has been under the orders of more than one senior officer. The administrative command of all these divisions and vessels being now centralized in the Commander-in-Chief of the home fleet, a far better organization

should be achieved than has been possible with a divided responsibility. His headquarters are at Sheerness, and he will occupy the house vacated by the transfer of the residence of the Commander-in-Chief at the Nore from Sheerness to Chatham.

The status of the Commander-in-Chief of the home fleet and that of the flag officers and vessels under his orders will be similar to that of the flag officers and vessels of the Channel and Atlantic fleets when they visit the home ports; that is to say, for the time being they come under the command of the senior officer present, but that senior officer will not interfere with the administration and orders of the officers in command. The home fleet in no way interferes with the *rôle* of the Channel and Atlantic fleets, except in the event of a totally unforeseen outbreak of war during their absence from home waters; they will still occupy the principal fighting position.

The fleet at sea will begin the new year without its most distinguished and capable figure through the termination of the appointment as Commander-in-Chief of the Channel fleet of Admiral Sir Arthur Wilson, V. C., G. C. B., one of the ablest and most trusted commanders the navy has had in recent years. Sir Arthur Wilson has a fine record of service as a most efficient officer at sea, in the battlefield on shore, as an administrator at the Admiralty, where he was Controller of the Navy, and finally as the Commander-in-Chief for six years of the most important of His Majesty's fleets. In spite of the sound and wise demand for young flag officers, there are still occasions when the whole navy regrets the inevitable operation of the age rule, and it is a notable one indeed when Sir Arthur Wilson brings to a close his last command afloat.—*United Service Institution.*

NAVAL QUESTIONS IN THE HOUSE OF COMMONS.—The following are official answers to questions asked in Parliament:

The date of the completion of the *Minotaur* and the *Shannon* is March 31, 1908. That of the *Defence* is December, 1908.

The decision to make the tonnage of the three battleships now building 650 tons greater than that of the *Dreadnought* had no relation to any experience gained in the trials of that vessel. It was intended to permit the embodiment of certain improvements.

On March 25, the approximate number of men in the naval service was 127,277. Of these 58,918 were in fully-manned ships, 18,979 in vessels with nucleus crews, 23,403 in barracks, 7526 in other shore establishments, and 18,451 in gunnery and torpedo school ships, training ships, and so on.

The expenditure on prizes for good shooting in the navy to petty officers, seamen, boys, and marines during the three financial years immediately preceding 1906-07 (for which the figures are not yet available), was as follows: 1903-04, £5879; 1904-05, £6144; 1905-06, £5765.

THE BOADICEA.—The preparation of a building slip to receive the keel of the new fast unarmored cruiser *Boadicea*, has been commenced at Pembroke dockyard. The principal dimensions of the vessel will be: Length, 385 feet; extreme breadth, 41 feet; draft of water, 13 feet 6 inches; displacement, 3300 tons. She has been specially designed for accompanying destroyers, and acting as a parent ship, in addition to carrying out the peace duties of a light cruiser, and will have a considerably wider radius of action than the existing scouts, which now discharge those duties. The ship, which is provided for in the Admiralty's program for the current year, is to be completed within 21 months from the 1st inst.—*United Service Gazette.*

Le Yacht gives the following details of the *Minotaur* class: The conning-towers are small, of circular form, and entered by a trap door, instead of oval, relatively large, and entered by a masked door. The prin-

cipal water-tight bulkheads are without any openings through them, seven elevators giving access to the main compartments. They are to be fitted with torpedo defence nets. All wood work has been replaced by an Italian composition called "corticine."

TWO MORE DREADNOUGHTS.—Orders have been received at the Portsmouth and Devonport dockyards to lay the keel of a battleship of the *Dreadnought* type in each yard as soon as the battleships *Téméraire* and *Bellerophon*, now in course of building, have been launched. They will be launched in August next.

The understanding was that in case the proposal for disarmament should take definite shape in the Hague Peace Conference only one new *Dreadnought* would be laid down. The order for two *Dreadnoughts* is Great Britain's acknowledgment of Germany's refusal to entertain the question of disarmament.—*New York Sun.*

The *Bellerophon*, *Téméraire*, and *Superb* are to have 4-inch guns for defence against torpedo-boats.

TORPEDO-BOAT DESTROYER AFRIDI.—The torpedo-boat destroyer *Afridi*, and her sister ship *Ghurka*, will constitute the fastest class of vessel in the British Navy. The *Afridi*, which is an ocean-going torpedo-boat destroyer, was launched on May 8, from the Elswick shipyard of Sir W. G. Armstrong, Whitworth & Co., Limited. Her length between perpendiculars is 250 feet, and her breadth, moulded, 25 feet. Her depth, moulded, is 15 feet 6 inches, and her mean draft, 7 feet 1 inch. The ship will carry three 12-pounder quick-firing guns, two of which will be mounted on the forecastle deck, and one on the upper deck aft. She will also be fitted with two 18-inch torpedo tubes, which will be mounted on the upper deck.

The machinery will be supplied by the Parsons Marine Steam Turbine Company, Limited, of Wallsend-on-Tyne. It will consist of a set of compound turbines, which will drive three propeller shafts, each fitted with one propeller. The boilers will be of the Yarrow type, and will develop approximately 14,500 horsepower. It is interesting to note that the Admiralty have decided to use oil instead of coal in these ships. Both the *Afridi* and the *Ghurka* have been designed for a speed of 33 knots.—*Engineer.*

THE INVINCIBLE CLASS.—The *Indomitable* is to be floated from the Fairfield Works at Glasgow on March 16; the *Inflexible* from the Clydebank yard of Messrs. John Brown & Co., Limited, on March 30; and the *Invincible* from the Elswick Works of Sir W. G. Armstrong, Whitworth & Co., Limited, on April 13. These vessels are the most remarkable cruisers yet built, alike for their gun-power and speed, and may be accepted as suggestive of the Admiralty's conception of the cruiser of the future. Their design has aroused considerable interest and criticism, not alone because of their great cost, which averages £1,729,000 each—equal to the price of a modern battleship—but because of a sharp difference of opinion as to naval tactics applicable to cruisers.

Hitherto the longest of the British modern cruisers have been the *Powerful* and *Terrible*, and the four armored ships of the *Drake* class, all of which had a length of 500 feet and a beam of 71 feet. Following the *Drake* class, completed six years ago, there was a tendency to decrease the length of the vessels, but later there has been steady advance. Thus the *County* class are 440 feet, the *Devonshire* class 450 feet, the *Duke of Edinburghs* 480 feet, and the *Minotaurs* 490 feet. The beam has, in the same period, been increased from 66 feet to 74½ feet. The three *Invincible* cruisers are 530 feet long and 78 feet 6 inches beam, the draft continuing, as in most of the recent armored cruisers, at 26 feet. This increase in length of 30 feet, as compared with the longest preceding

cruiser, and of 40 feet as compared with the immediate predecessor, is necessary partly to enable high speed to be realized with the minimum of power, as the form for a given displacement may be finer, but it is a consequence also of the need for satisfactory disposition of the guns. It was laid down as an essential condition, first, that all the guns of the primary battery should be of 12-inch caliber—a condition never before exacted in any ship except the *Dreadnought*—and, second, that all the guns should have an arc of training to enable them to fire on either broadside and through very large arcs forward and aft. Eight guns are mounted in pairs in barbettes, one forward and one aft, and one on each broadside, but not, as in previous ships, on the same transverse line, the port barbette being some distance forward of the starboard barbette. This constitutes, as we have already indicated, a broadside armament equal to that of any ship afloat, equal even to the *Dreadnought*, and it will be interesting to show in tabular form the progress in the gun-power of successive armored cruisers.

Broadside Fire of Successive Armored Cruisers.

Class and Year of Launch.	Designed Speed,	Displacement,	Number and Caliber of Guns firing on each Broadside.	Collective muzzle energy from one Round,
	knots.	tons.		foot-tons.
County (1900)	23	9,800	Nine 6-in.	30,200
Drake (1901)	23	14,100	Two 9.2-in. Eight 6-in.	68,600
Devonshire (1904) .	22.25	10,850	Three 7.5-in. Three 6-in.	40,400
Duke of Edinburgh (1904)	22.75	13,550	Four 9.2-in. Five 6-in.	99,500
Minotaur (1906) ...	23	14,600	Four 9.2-in. Five 7.5-in.	137,000
Invincible (1907) ...	25	17,250	Eight 12-in.	381,576

It will be seen that in seven years the displacement tonnage has been doubled, and that the collective muzzle energy from one round has increased more than twelvefold. What is of more importance, however, is that the *County* class are only capable of fighting at three miles' range, and even then against inferior ships. It is true that the *Drake* class of six years ago can effectively bring to bear two guns at four miles' range; the *Duke of Edinburgh* class and the *Minotaur* class, four guns of the same range; whereas the *Invincibles* will be able to utilize all of their eight guns at five miles' range, and then to do effective work against any foreign battleship. In this way they will be able to combat an equal number of battleships of the enemy's force while doing reconnoissance work, having at the same time a speed which will enable them, after gleaning all information as to the force of the enemy, to return to the Admiral with full knowledge of the strength of his opposing force. Although their armor protection may not be as effective as the latest of our battleships, they will still be able to take their place in the line of battle; and on the principle that the most effective defence is an active and preponderating offence, they will do effective duty.

The value of the superior gun-power is further considerably augmented, not only by the unification of the caliber of the gun, but because of the exceptionally high freeboard of the ships. In the preceding cruisers—notably the *Duke of Edinburgh* class and the *Minotaur*—the forward guns were placed on the forecastle, which was cut away on each side to enable the wing guns on the upper deck level to fire ahead. These wing guns, like all the other primary weapons in the ship, are in these earlier cruisers

on the upper deck level. In the new ships the broadside guns are on the same level as the forecastle, and therefore at a great hight above the water-line. The aft pair of guns alone are on the upper deck level; but the deck erection to the rear of these stern guns is cut away at an acute angle on each side to enable the aft weapons to train as far as possible forward of the beam. The disposition of the guns and machinery has involved difficult problems in order to secure a wide arc of training.—*Engineering.*

LAUNCH OF H. M. S. INDOMITABLE.—On Saturday, March 16, his Majesty's ship *Indomitable* was successfully launched into the Clyde by the Fairfield Shipbuilding and Engineering Company, Limited, Govan. The customary bottle of wine was smashed against the ram—a feature which is much less pronounced than in older types of warships—and a moment later the vessel began to move down the ways. From the first movement until the hull became completely waterborne the time occupied was 1 minute 20 seconds. With due reservation, what follows regarding the Fairfield cruiser and her two sister ships—the *Inflexible*, on the stocks at Clydebank, to be launched on March 30, and the *Invincible*, being built at Elswick, to be launched on April 13—may be taken as in the main correct.

The dimensions, power, and speed, etc., of the three ships, which are identical in design, are: Length, 530 feet; breadth, 78 feet 6 inches; draft, 26 feet; weight of hull, 9660 tons; displacement, 17,250 tons; indicated horsepower, 41,000; speed, 25 knots; coal capacity at load draft, 1000 tons. The vessels have a complete broadside armor from bow to stern, the maximum thickness being 7 inches, tapering to 4 inches at each end. The armor extends from under the water-line to near the upper deck. In respect of protection, therefore, the *Indomitable* and her consorts are, perhaps, superior to previous vessels, just as they are certainly superior to their predecessors in gun power. Indeed, this new class of cruiser might, almost under any condition, tackle heavy battleships. Their length is 30 feet greater than that of any preceding British cruiser, and the displacement tonnage is 2650 tons more than that of any hitherto built. The Fairfield-built cruiser *Cochrane*, for instance, which has recently been put through all her trials with conspicuous success, is 480 feet long as against the *Indomitable's* 530 feet, has 13,550 tons displacement as compared with the 17,250 tons, and 23,500 indicated horsepower as compared with 41,000 indicated horsepower. The designed speed of the *Cochrane* was 23 knots as compared with the 25 knots of the *Indomitable*. The machinery of the three vessels is of the Parsons steam turbine type, steam being supplied from water-tube boilers, some of the vessels having the Yarrow boiler, and others the Babcock and Wilcox. As in the case of the battleship *Dreadnought*, the new cruisers have four lines of shafting, each carrying a three-bladed propeller of bronze. In the disposition of propellers, and in the design of the after run of the vessel, it was seen, from distant observation of the vessel before her send-off, that considerable departure from conventional practice has been made. The general impression conveyed was of effort and ingenuity having been exercised in diminishing needless excrescence and surface in the form of "deadwood," and leaving everything conducive to solid and undisturbed water in the region of the propellers; the rudder apparently being hung or supported on a very light structural arrangement. On each of the two inner shafts there will be a cruising turbine, a low-pressure ahead and a low-pressure astern turbine, while on each of the outer shafts there will be a high-pressure astern turbine, as well, of course, as the forward turbine. For low powers the steam thus passes through three turbines before entering the condenser, and the range of expansion is suggested by the fact that the blades of the turbines vary in length from something less than 1 inch up to 16 inches. There is a longitudinal bulkhead dividing the port and

starboard engine-rooms, in each of which there are thus five turbines and a condenser.

Even more than speed, the dominant feature of the *Indomitable* and her consorts is armament. The advance in this respect over previous vessels of the kind is enormous. Compared, for example, with the first-class cruiser *Cochrane*, recently handed over by Fairfield, the *Indomitable* has over double the hitting energy. The *Cochrane* has six 9.2-inch and four 7.5-inch guns, equal to a force of 161,470 foot-tons for one full broadside round. In the *Indomitable* there are eight 12-inch guns, equal to the enormous destructive power of 381,576 foot-tons for one broadside round. This forms a striking example of the advance made within a period of two years in the aggressive or defensive powers of a type of vessel in which at first high speed was the distinctive quality aimed at. In the new vessels there is a corresponding gain in bow and stern fire, as they can operate six 12-inch guns ahead and six astern.

The progress made with these ships has been very satisfactory. The keel of the Fairfield vessel was laid on March 1 last year, and by the end of this month she will have had spent upon her the sum of £1,470,375. The keel of the Barrow ship, the *Inflexible*, was laid on February 5 last year, and has had voted for progress with her construction up till the end of this month the sum of £1,421,479. The keel of the *Invincible* at Elswick was laid on April 2, and on her there will have been spent up to the end of this month £1,417,732. There is every prospect of all the vessels being completed for service 14 or 15 months hence, well within the contract time of two years and three months.—*Engineer.*

LAUNCH OF H. M. S. INVINCIBLE.—The new cruiser *Invincible* was launched from the Elswick yard on April 13.

She has a length of 530 feet, a beam of 78 feet 6 inches, and when displacing 17,250 tons draws 26 feet of water. At this draft she has a capacity for carrying 1000 tons of coal, and a large quantity of oil-fuel. While protected as effectively as the majority of battleships, excepting perhaps only the *King Edward VII* and *Dreadnought* classes, she is excelled in her gun-power only by the *Dreadnought*. The main armament includes four pairs of 12-inch guns, mounted in four barbettes—one forward, one aft, and two amidships, the latter *en échelon* between the second and third funnels, which are, therefore, at a greater distance apart than the two forward funnels. The magazines for these guns are located between the second and third boiler-rooms. This arrangement of guns will enable the amidship guns to fire on either broadside, although their arc of training forward and abaft of the beam on the off broadside may be more limited than in the case of the *Dreadnought*. In the broadside action, however, the ship will have the same fire as the *Dreadnought*, while forward as well as aft she will use six 12-inch guns. The secondary armament for repelling torpedo attack consists of a large number of 4-inch quick-firing guns. The turbine machinery, which is being constructed by Messrs. Humphrys, Tennant & Co., of London, is to develop 41,000 indicated horsepower, and the legend speed is 25 knots. There are four screws and two rudders. All of the screws have four blades, and the outer propellers are about 30 feet ahead of the inner propellers, the latter being close up against the rudders, which are entirely suspended from the counter of the ship within which the steering-gear is fitted.

The vessel is in an advanced state, the launching weight being 8400 tons. The drags consisted of nine piles of chains, resting on the ground on each side of the ship, the total weight being 450 tons. The cradle, which in the case of fine-ended ships is always a subject of interest, was made up somewhat differently from the practice in most naval construction works. The rows of poppets at the forward end were not continuous. There were three spaces left. The tops of the poppets were housed in the steel structure, from which there were plates extending under the ship,

from the port to the starboard poppets; but instead of this metal structure, with its lashings, being secured to the hull, as in some instances, it was independent, and the ship was snugly cradled inside the plating with timber wedges. In this way some play was possible within the cradle, a matter of some importance when the stern of the ship is floated in the process of launching. It has been found in recent launching practice that, in cases where the framing has been bossed out for twin-screw propeller-shafts, the stern becomes water-borne at an earlier period than was formerly the case, and, as a result, the consequent thrust on the forward cradle is earlier and the tendency to movement of the ship of greater duration. There is, however, the further fact that the speed down the ways does not attain the same high velocity. In the case of the *Invincible* the time occupied from the first perceptible movement until the vessel was completely afloat was just under 50 seconds.

The release of a vessel of such weight is also of interest, and the method adopted at the Elswick Works was notably successful. The last dagger dropped was hydraulically operated. This dagger was of steel, pivoted to the bottom of the standing-way, and projecting through it into a bearing constructed of forged steel in the bottom of the sliding-way. To the upper part there was secured a counterbalance weight, while the bottom abutted against a ram working in a cylinder in which the hydraulic pressure was 100 pounds. Lady Allendale, who released and named the ship, working a small capstan, opened the valve, and the receding of the arm within the cylinder caused the dagger to incline to the horizontal position, and thus gradually released the sliding-ways and the ship. The ship was held rigidly until the moment of release, and at the same time there was certainty of release.—*Engineering.*

In the matter of injuries to ships, fate seems to be working as hard as the government in the direction of reduction. The following is a not necessarily complete list of ships that have been ashore or badly damaged in collision during the last year or so: *Donegal, Good Hope, Dominion, Commonwealth, Montagu, Mars, Duncan, Albemarle, Prince George.*

Of these the *Good Hope* ripped up a good deal of her bottom; but as she was doing nearly 24 knots recently, her injuries must have been of a very temporary nature. The *Donegal* got off less lightly, and will probably always be something of a lame duck. The *Dominion* certainly will be, and the *Commonwealth* is likely to be non-effective for many months. The *Montagu*, of course, has gone for good. The *Mars* scraped her bottom at the Needles entrance to the Solent; no information is forthcoming as to her present condition. The *Duncan* grounded at the time of the *Montagu* salving, and probably did herself no good. The *Albemarle* has been reported very seriously injured by the recent collision; but from all accounts her name was used in error for the ship that she hit. Her real injuries are believed to be small. The *Prince George* is, or ought to be, used to accidents by now, and seems to have been unhurt by her recent hitting of a sand bank.—*Engineer.*

THE DREADNOUGHT.—To minimize the possibility of collision and wreck of warships it is self-evident that handiness is of the utmost importance. Quick obedience to helm, smallness of turning circle, and, above all, celerity in actually moving astern from full speed ahead as well as in steering when moving astern, are indispensable. We publish some of the results of trials in the *Dreadnought*, which may give food for thought, more especially as there is an impression extant that this warship lacks some of these desirable qualities. Especially that at speeds of about 18 knots it is said that the astern turbines are inclined to "refuse duty," and act only when the way is off the vessel.

It will be observed that even with the engines going astern, from 12 knots ahead, the vessel does not lose her way until she has forged ahead

725 yards; at 20 knots speed ahead she would come to rest after traversing 1027 yards. So that two *Dreadnoughts* meeting end on at 20 knots, each reversing its engines when a nautical mile apart would eventually meet and touch before losing their way.

It will be noted that the approximate diameter of the turning circles are 865 and 825 yards at 19 and 12 knots speed respectively, with both sets of engines going ahead. But with the starboard engines going astern, and the port engines ahead, only 22 points of the circle were completed, the ship then being "in irons," due probably to the wind.

The stopping and starting trials are of interest, and to those desiring celerity of response to the telegraph at all times they give matter for conjecture and comparison with the reciprocating engine driving larger propellers.

STOPPING AND STARTING TRIALS.

Heads of information.	Starboard.	Port.
	Secs.	Secs.
Stopped from full speed ahead.....	14	20
Being stopped, started ahead.....	3·5	3
From full speed ahead to full speed astern, engines stopped	10	11
Do. do., engines started astern.....	26	31
Do. do., engines going full speed astern....	33	75*†
Stopped from full speed astern.....	9	10
Being stopped, started astern.....	7·5	4
From full speed astern to full speed ahead, engines stopped	13·5	14
Do. do., engines started ahead.....	23·5	26
Do. do., engines going full speed ahead.....	33	110*‡

Remarks.—*The port engines might have been worked up to full speed more quickly; the regulating valve was opened very gradually.
†Revolutions per minute, starboard 200, port 224.
‡Revolutions per minute, starboard 200, port 222.

Trial to test time taken to stop ship when steaming ahead at 12 knots (mean revolutions starboard 186, port 184), by putting engines full speed astern.

The following table shows rate of revolutions per minute astern at intervals of 15 seconds after receiving the order "Full speed astern."

Order—"Full speed astern."	Revolutions per minute. Starboard—Inner shaft.	Starboard—Outer shaft.	Starboard—Mean.	Port—Inner shaft.	Port—Outer shaft.	Port—Mean.	Mean of S. and P.
15 seconds after order	112	48	80	96	80	88	84
30 " " "	256	80	168	160	80	120	144
45 " " "	272	80	176	192	80	136	156
60 " " "	208	144	176	208	96	152	164
75 " " "	192	160	176	208	128	168	172
90 " " "	192	144	168	192	176	184	176
105 " " "	192	144	168	176	160	168	168
120 " " "	176	144	160	192	176	184	172
135 " " "	176	144	160	192	176	184	172
150 " " "	192	144	168	192	176	184	176
165 " " "	208	144	176	176	144	160	168
180 " " "	192	144	168	176	144	160	164
183 " " "	Ship stopped after forging ahead 725 yards.						

TIME, INITIAL PRESSURES, AND REVOLUTIONS TAKEN ON ASTERN TRIALS.

Time.	Initial pressures, lb.				*Vacuum in condensers, inches.		Revolutions per minute.			
	Starboard.		Port.				Starboard.		Port.	
	H.P.	L.P.	H.P.	L.P.	Starboard.	Port.	Inner.	Outer.	Inner.	Outer.
h. m. h. m.										
3 14 to 3 15	117	30	115	25	24	24	200	104	118	118
3 15 " 3 16	..	..	..	..	..	..	208	152	222	16
3 16 " 3 17	..	..	..	..	..	..	212	156	228	16
3 17 " 3 18	115	21	110	29	25	27	216	160	230	17
3 18 " 3 19	..	..	..	..	..	..	224	172	234	18
3 19 " 3 20	..	..	..	..	..	..	236	192	238	18
3 20 " 3 21	..	..	..	..	..	..	252	196	232	25
3 21 " 3 22	125	34	115	30	26	27	252	216	228	23
3 22 " 3 23	..	..	..	..	..	..	252	216	228	23

REMARKS.—3 h. 14m., engines working full speed ahead about 20 knots. Order given, "full speed astern."
3h. 15m., both engines going astern.
3h. 17m., ship stopped.
3h. 21m., full speed of ship astern reached (about 15 knots).

RECORD OF CIRCLE TRIALS.

Both engines ahead, excepting in No. 5. The engines were steadied on the straight, and regulating valves were not moved during circles.

Observations before starting circle.

Speed in knots.	Helm.	Revolutions per minute.						
		Starboard.			Port.			Mean of S. and P.
		Inner.	Outer.	Mean.	Inner.	Outer.	Mean.	
19	P	280	280	280	282	284	283	281.5
19	S	268	260	264	236	248	242	253.0
12	P	180	188	184	174	188	181	182.5
12	S	186	200	193	176	200	188	190.5
12	P	160	172	166	170	192	181	173.5

Time to put helm hard over from amidships.	Time on circle.	Observations during circle.						
		Revolutions per minute.						
		Starboard.			Port.			Mean of S. and P.
		Inner.	Outer.	Mean.	Inner.	Outer.	Mean.	
Seconds.	m. s.							
17	3 15	262.1	259.7	260.9	260.9	262.1	261.5	261.2
15	3 15	258.4	256.0	257.2	294.8	249.8	272.3	264.8
13	4 49	156.9	170.2	163.6	150.4	177.7	164.0	163.8
12	4 54	160.0	173.1	166.5	176.7	177.1	166.9	166.7
13	*8 17	156.8	136.6	162.7	150.6	166.1	161.3	161.0

* In No. 5 circle, starboard engine astern, port engine ahead, ship turned through 22 points in 8 m. 17 sec., then became virtually stopped.

OIL FUEL STORAGE.—The Admiralty have decided to provide storage accommodation at the various government dockyards for 20,000 tons of oil fuel, for supply to war vessels at each port. Steel tanks, each to hold 5000 tons, are to be constructed, and surrounded by earth works, while gangways will be made from berts to the tanks, and oil mains will be laid under the gangways to allow oil steamers to discharge into the tanks, and for warships to draw their supply. The oil fuel berts are to be accessible for the largest battleships and cruisers at any stage of tide.—*United Service Gazette.*

At the public sale of obsolete warships and other vessels, held at Chatham dockyard last week, the prices realized were as follows: First-class battleship *Sans Pareil,* £26,000; third-class battleship *Conqueror,* £16,800; first-class armored cruiser *Undaunted,* £14,400; torpedo gunboat *Alarm,* £3650; steam yacht *Wave,* £925; torpedo-boat destroyer *Skate,* £305. It was stipulated that the warships should be broken up in the United Kingdom within two years.—*United Service Gazette.*

A system of automatic danger signals, devised by Mr. W. D. Kilroy, and intended to give warning to the man in charge of a gun whenever his gun is so trained that by firing it he might injure another gun, has been installed in the *Dreadnought* and is being installed in the new *Dreadnoughts* and the *Invincible* class. A danger signal is displayed and at the same time a trumpet sounds on that side of the man's head on which damage will be done if he fires.

ITALY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Roma	12,625	Gov't Yard, Spezia.	Launched Apr. 21, 1907.
Napoli	12,625	" " Naples.	" Sept. 10, 1908.
Vittorio Emanuele	12,625	" " Castellamare.	" October 1, 1904.
Regina Elena	12,625	" " Spezia.	Under trial.
Armored Cruisers.			
San Giorgio	9,800	Gov't Yard, Castellamare.	Building.
San Marco	9,800	" "	"
Pisa	9,800	Orlando.	"
Amalfi	9,800	Odero.	"

The *Roma,* launched at Spezia on April 21, 1907, is of 132.6 m. length, 22.4 m. beam, 8.3 m. draft, and 12,630 tons displacement. She carries two 12-inch, twelve 8-inch, twelve 3-inch, and twelve 47-mm. guns, with four under-water torpedo tubes. Her main belt is 10 inches thick, tapering to 4 inches at the ends; above this is 8-inch armor extending from the rear end of the central redoubt to the bow; the armored deck is 4 inches thick; the 12-inch turret armor is 10 inches, and that of the 8-inch turrets 6 inches thick. Her speed is to be 22 knots, and she is to carry 670 men.

The new Italian submersible boat *Glauco,* constructed at the Royal Italian Dockyard, Venice, is fitted with Fiat-Muggiano explosion motors. She is the first of a series of five submersible torpedo-boats which the Italian Navy will have completed in the course of a few months. Their displacement when fully emerged is 175 tons, and 220 tons when completely submerged. They are designed for a speed afloat of 15 knots, using the explosion motors only, and for a cruising speed of 10 knots. The fuel carried is sufficient for a run of 175 miles at the higher speed, and for 600 miles at the 10-knot speed. The time required for diving when fully emerged is five minutes. Each boat carries two torpedo-tubes for 18-inch

torpedoes. Their length and breadth at water-line afloat are respectively 137 feet 9 inches and 14 feet 11 inches. The reserve of buoyancy when fully emerged is said to be 120 tons.—*Page's Weekly.*

The long-delayed *Vittor Emanuele* class is approaching completion, and the first ship, the *Regina Elena*, has done her trials with remarkable success, the designed 22 knots being greatly exceeded.—*Engineer.*

The *Regina Elena* made 20 knots on her preliminary trial. She will soon begin her acceptance trials.

The *San Giorgio* is to be launched in August, her sister ship, the *San Marco*, is barely begun.—*Le Yacht.*

JAPAN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Satsuma	19,000	Yokosuka.	Launched Nov. 13, 1906.
Aki	19,000	Kure.	" Apr. 15, 1907.
Armored Cruisers.			
Ikoma	13,750	Kure.	Launched April 3, 1907.
Ibuki	13,750	Yokosuka.	Building.
Kurama	13,750	"	"
Protected Cruiser.			
Tone	4,100	Sassebo.	Building.
Scouts.			
Yodo	1,850	Kobe.	Building.
Mogami	1,350	"	"

The *Aki*, sister ship to the *Satsuma*, was launched on April 15, 1907. She is to have turbine machinery (Curtis type), and her main battery is said to consist of four 12-inch and twelve 10-inch guns. *Le Yacht* gives her battery as four 12-inch, either twelve or ten 10-inch and twelve 4.7-inch guns.

THE BIGGEST BATTLESHIP.—In the *Aki* Japan gains the distinction of having the biggest battleship. She has a displacement of 19,800 tons, a length of 492 feet and a beam of 83½. Her engines, which are turbines, will be of 25,000 horsepower, and it is estimated that she will have a speed of 21½ knots. She has three funnels, against the *Satsuma's* two. Her armor belt is 9½ inches. She will carry four 12-inch guns, twelve 10-inch and eight 6-inch.

The *Aki* was designed and constructed exclusively by Japanese, the principal constructors being Rear-Admiral Kitakoga, Capt. Obata and Capt. Mizutani. Her keel was laid on March 15, 1906.—*New York Sun.*

The Japanese cruiser *Kurama* will be launched at Yokosuka in September next. The *Tone* will be launched about the same time at Sassebo. The *Yodo's* launch is fixed for October at Kawasaki, and the *Mogami's* in August.

Of the ex-Russians, some will be ready for service at the end of the year, the dates being as follows: *Sagami* (*Peresviet*) in November; *Iwami* (*Orel*) in June; *Tango* (*Poltava*) in November; *Minoshima* (*Sinavin*) about May or June; *Tsugaru* (*Pallada*) in November next.

The *Iki* (*Nikolai*) *Okinoshima* (*Apraksin*), and *Soya* (*Variag*) have already been repaired. The *Suwo* (*Pobieda*) and *Hizen* (*Retvizan*) appear to hang fire, and are probably beyond repair when the cost is considered.

Of the *Aso* (*Bayan*) contradictory tales exist. According to some stories, she will soon be ready for sea; while others assert that she was more damaged than any. It is known that at least six 11-inch shells hit her. She was also badly damaged by a mine, and finally the Russians exploded heavy charges at six different places under water in her. The amount of original *Bayan* left must therefore be extremely small.—*Engineer.*

Japan is initiating a scrapheap policy for old ships, and the following are all to go between now and December, 1908: Battleships: *Chin Yen, Fuso.* Cruisers: *Metsushima, Hoshidate, Itsukushima, Akitsushima Nanissu, Takachiho, Chiyoda, Idzumi.* Gunboats: *Takao, Yaeyama, Tatsuta.* —*Engineer.*

The *Tsukuba*, whose keel was laid in January, 1905, was launched in December of the same year; and her equipment having been completed on February 10, she was delivered by the Kure navy yard authorities to her present commander, Capt. Takenouchi, on February 14 last in order that she might take her place as a unit of the Second Squadron. This armored cruiser is 440 feet in length, 75 feet in beam, of 13,750 tons displacement, and about 20,000 horsepower. Her armor belt of Krupp steel ranges from 4 to 7 inches and her intended speed was 20 knots, but she made about 21 knots in her speed trial. As her construction was commenced after about a year's experience of modern naval warfare, it is known that she embodies a number of valuable lessons derived therefrom. In appearance the big cruiser marks a striking departure. Not only has the ram, with which we have so long been familiar, been omitted, as is the case with the *Satsuma*, but she has a "schooner bow." Thus the cruiser has been especially strengthened forward and the overhang of the bow to the cut-water is expected to keep the fore part of the ship comparatively dry in a heavy sea. The 14 ventilators of the ship being very low are invisible from outside and little exposed to the enemy's fire. They are also different in construction and shape from those of most other warships. Among other departures, ammunition passages have been dispensed with and a new arrangement has been made instead. Special ammunition hoists being provided for the 12-inch guns. The forward conning-tower has no side entrance at the back of its wall, but is entered from the upper bridge through a trap-door on the roof of the tower. There are smaller conning-towers also over the 6-inch guns on the upper and main decks to control the gun fire. Her great width, which is 75 feet, was probably a record in cruiser construction at the time she was designed. The *Tsukuba* is the first cruiser ever equipped with 12-inch guns, of which she has four—two in the forward and two in the after barbettes on the upper deck. Besides, the ship carries twelve 6-inch quick-firing guns, an equal number of 4.7-inch quick-firers, two 12-pounders, and four Maxims. She can bring four 12-inch guns, six 6-inch guns, and six 4.7-inch guns to bear in broadside fire. As to the fore fire, the cruiser can most effectively train two 12-inch guns, four 6-inch guns, and four 4.7-inch guns.

Although no official statement of her steam and gun trials has been given to the public, this much is absolutely certain, that not only was everything satisfactory, but in some important respects the results of the trials exceeded expectations. Her maneuvering power is said to have proved exceptionally good, the ease with which she was steered and handled to have been very remarkable, and even the rough weather which she experienced at the time failed to make her roll to any perceptible degree. In all her gun trials the results were, according to accounts, all that could have been desired.

Vice-Admiral Ijuin, commander-in-chief of the Celebration Squadron, sprang from the warlike clan of Satsuma, which produced Saigo, Okubo, Togo, and many other heroes. He was born in 1852 and took part in the

War of the Restoration when he was quite young. In 1871 the vice-admiral attended the Naval College, Tokio, and six years later he was sent to England to prosecute his naval studies. While there he served on board the British warship *Triumph* and was also admitted to the Greenwich College. In the time of the Japan-China war, the vice-admiral was a captain and held the post of naval staff officer at the imperial headquarters. In March, 1902, he was appointed commander of the Standing Squadron, and was sent to England in command of the *Asama* and the *Takasago* to participate in the ceremonies in connection with the coronation of King Edward. In September, 1903, he was promoted to the rank he now holds and appointed vice-chief of the Naval Staff Office under Admiral Viscount Ito. During the Russo-Japanese war, he was put on the naval staff of the imperial headquarters and took part in its councils, doing distinguished services to the State. In November last the vice-admiral was transferred to his present post of commander-in-chief of the Second Squadron. He is the inventor of a special fuse, which made possible the use of the Shimose explosive. During the late war, Capt. Takenouchi, commander of the *Tsukuba*, commanded the *Nisshin*, and Capt. Yamaya, commander of the *Chitose*, commanded first the *Akitsushima* and then the *Kasagi*, both rendering meritorious services which were duly recognized. The crews of the two cruisers are most of them men who took part in the war.

According to the itinerary already published, the squadron is expected to arrive at Jamestown on May 8 and to stay there for about twenty days, after which it will visit New York, London, Wilhelmshafen, and Cherbourg. The warships will return to Yokohama in November.—*Scientific American.*

RUSSIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Emperor Paul I	16,900	St. Petersburg (Baltic Yard).	Building.
Andrei Pervozvannui	16,900	St. Petersburg (Galernéy Island).	Launched Oct. 28, 1906.
Evstafi	12,500	Nicolaiev.	" Oct. 1906.
Ivan Zlatoust	12,500	Sevastopol.	" May 13, 1906.
Armored Cruisers.			
Admiral Makaroff	7,800	La Seyne.	Launched May 8, 1906.
Bayan	7,800	St. Petersburg.	Building.
Pallada	7,800	"	Launched Nov. 10, 1906.
Rurik	15,000	Vickers.	" Nov. 17, 1906.
Protected Cruiser.			
Outchakoff	6,750	Sevastopol.	Building.

THE RURIK.—The Russian first-class armored cruiser, *Rurik*, which was launched on November 17, 1906, by Messrs. Vickers, Sons & Maxim, is of special interest, since she may fairly be assumed to embody the results of experience hardly won in actual fighting during the Russo-Japanese war. The old *Rurik* was thought a remarkable vessel when she was launched 16 years ago, but as a fighting machine she is far outclassed by her successor. She was 426 feet long, 67 feet in beam, 29¾ feet in draft, and of 10,940 tons displacement, while her engines developed 13,500 I. H. P., and gave her a speed of 18.7 knots. The new *Rurik* is 490 feet long, has a beam (moulded) of 75 feet, is 26 feet in mean draft, and displaces 15,000 tons. Her two sets of four-cylinder, triple-expansion, balanced engines are to develop together 19,700 I. H. P., transmitted to two three-bladed propellers by hollow propeller shafts 19 inches in diameter, and designed to give her a speed of 21 knots on trial, with 1200 tons of coal on board, which is the

amount she is calculated to carry at normal draft. Her 28 Belleville boilers supply steam at a pressure of 250 pounds to the square inch, and it is stipulated that the trial speed of 21 knots must be attained with one-quarter of the number out of use; they have a total heating surface of over 55,000 square feet, and are fitted with arrangements for burning oil fuel, of which the ship carries 200 tons, in addition to her coal. In regard to armament, the old *Rurik* had four 8-inch breech-loading guns, one 6-inch and six 4.7-inch quick-firing guns, and six torpedo tubes. The new *Rurik* will have four 10-inch breech-loading guns, eight 8-inch and twenty 4.7-inch quick-firing guns, twelve smaller quick-firing guns, and two submerged torpedo-tubes. The 10-inch guns are contained in two barbettes on the center line, one forward and one aft, while the 8-inch ones are twin-mounted in four barbettes. The armor of the barbettes is Krupp cemented, 7¼ inches thick, and the guns, which are 50 calibers in length, are electrically worked. Of the twenty 4.7-inch guns, sixteen are placed on the upper deck in a battery some 200 feet long protected by 3-inch armor, and four stand aft on the main deck in a battery with armor of the same thickness. An armored belt, 6 inches thick amidships and 3 inches and 4 inches thick at the ends, encircles the ship at the water-line, joining the armor of the batteries. In addition to these protective measures, every precaution has been taken to secure, so far as possible, that any damage sustained shall not put the ship out of action. The conning-tower forward, the observing-tower aft, and the four range-finding towers are all heavily armored; but, even if they were all rendered useless, the ship could still be worked from an armored station under water. The water-tight bulkheads have been made unusually strong so as to withstand high pressures without yielding, and each of the more important water-tight compartments is provided with a powerful electrical pump of its own, to clear it if flooded, the motors being arranged above the water-line. Electricity is very extensively employed throughout the ship, and the dynamos, wiring, etc., are so arranged that in the event of one system being disabled another will be available. The rudder is provided with both electrical and steam steering gears, and has a device by means of which it can be disconnected from both at will, to preclude the possibility of its becoming fixed, by damage or accident, in such a way as to impede the navigation of the ship. The funnel casings are armored, experience having shown that when they are pierced by shot it becomes very difficult to work and fight the ship owing to the flame and smoke poured out through the holes. Finally, it may be mentioned that in the *Rurik* torpedo-nets and booms have been dispensed with, and reliance is placed on structural arrangements to guard against the loss of the ship by torpedo attack.

The new second-class armored cruiser *Admiral Makaroff*, which was launched last spring from the La Seyne Yard, near Toulon, has the following dimensions: Length, 443 feet; beam, 57 feet 6 inches; displacement, 7900 tons, with a draft of 21 feet 4 inches. The engines are to develop 16,500 I. H. P., to give a speed of 21 knots, steam being furnished by Belleville boilers with economisers; the normal coal capacity is 750 to 1020 tons. Protection is afforded by a water-line belt of Krupp hard steel 7 inches thick, tapering to 4 inches at the extremities, with an upper belt 3.5 inches thick, tapering to 2.7 inches at the extremities. The barbettes are protected by 5.8-inch armor and the casemates by 3-inch armor. The protective deck is 2 inches thick, and the conning-tower 5.4 inches, with a 3-inch communication tube. The armament will consist of two 8-inch guns in barbettes fore and aft, eight 6-inch quick-firing guns in casemates, with twenty 15-pounder quick-firing guns, four 6-pounders, and two submerged torpedo-tubes.

There have also been completed during the last year by the same firm four destroyers, the *Iskussmy, Ispoinitelay, Krepky, Legki*, while four others of the same type are completing at Havre. The dimensions of these vessels are: Length, 185.3 feet; beam, 21 feet; draft, 13.4 feet, with a

displacement of 335 tons; the engines are to develop 6000 I. H. P., giving a speed of 26 knots, while the armament will consist of one 13-pounder, five 3.5-pounders, and two 18-inch torpedo-tubes. Four other destroyers are also being built at Havre of the French *Framée* type, with a length of 187 feet, a displacement of 330 tons; engines to develop 6000 I. H. P., giving a speed of 26 knots, and the same armament as given above.—*Times, Le Yacht,* and *Marine Rundschau.*

Preparations for building a *Dreadnought* have commenced in Russia at Galernii Island Dockyard. This ship will carry ten 12-inch, but be of over 22,000 tons displacement. It is estimated that she will cost well over two million pounds.—*Engineer.*

UNITED STATES.

VESSELS BUILDING.

No.	Name.	Speed. Knots.	Where Building.	% of Completion June 1, 1907.
	Battleships.			
23	Mississippi	17	Wm. Cramp & Sons.	87.5
24	Idaho	17	Wm. Cramp & Sons.	79.9
25	New Hampshire	18	New York Shipbl'g Co.	72.5
26	South Carolina	18.5	Wm. Cramp & Sons.	14.8
27	Michigan	18.5	New York Shipbl'g Co.	14.4
	Armored Cruisers.			
6	California	22	Union Iron Works.	99.6
9	South Dakota	22	Union Iron Works.	97.4
12	North Carolina	22	Newport News.	80.7
13	Montana	22	Newport News.	74.9
	Scout Cruisers.			
	Chester		Bath Iron Works.	78.6
	Birmingham		Fore River Shipb'g Co.	75.3
	Salem		Fore River Shipb'g Co.	77.0

The Navy Department is showing a pronounced desire to place afloat within the shortest possible time all vessels now on the ways, of which there are a considerable number in an almost completed state. In some cases vessels have reached an advanced state of construction and have apparently come to a halt. So noticeable is the disposition to end unnecessary delay that the effect will be, it is believed, to make an unusually large addition to the navy within a year. If the department plans are fulfilled, the addition to the naval establishment within the period from now until next spring will comprise five new battleships, four armored cruisers, three scout cruisers, four submarine torpedo boats and one or more destroyers.

This will leave the Bureau of Construction clear of all contracts except those for the battleships *South Carolina* and *Michigan,* two colliers, a number of destroyers and the two 20,000-ton battleships authorized by the last Congress. Though the bids for these latter ships will be advertised for on April 20, it is not thought that they can be completed in less than three years, and there will be apparently a period of less pronounced activity during that interval than has been the case in the last few years, when under the naval program a large number of new ships have been on the ways.

Delivery to the government recently of the *Kansas* now leaves only the battleships *Nebraska, Mississippi, Idaho, New Hampshire, South Carolina,* and *Michigan* to be completed. Of these the *Nebraska,* according to a statement on progress of construction, is 99.20 per cent completed at the Moran Brothers' yard. Her construction work has progressed slowly recently, but the direction by the department to expedite matters, it is believed, will result in her delivery within three months.

The *Mississippi* and *Idaho*, both under construction by the Cramp Co., are practically up to the requirements, and have progressed greatly within the last month, so that they should be ready easily by next fall. The *New Hampshire* is 64.7 per cent completed and is due to be delivered by next spring.

Work on the *South Carolina* and the *Michigan* is well started. Of the armored cruisers, the *California* and the *South Dakota*, contracted for by the Union Iron Works, are 99.6 and 97.1 per cent completed respectively. They are expected to be ready within three months. The *North Carolina* and the *Montana*, at the Newport News Shipbuilding & Drydock Co.'s yards, are well advanced and are to be ready early next year. The scout cruisers *Chester*, *Birmingham*, and *Salem* are all in about the same state of construction, and will be added to the navy within less than a year.

All that is delaying the completion of the new submarine boats authorized some time ago is the official trial of various types to be made at Newport the end of April. The Navy Department has two colliers, the *Vestal* and *Prometheus*, under way. Contracts for five destroyers are to be let shortly. Two of these were authorized a year ago and three in the previous year.

At the present rate of building, the number of battleships in the United States Navy a year from now should be twenty-five and of armored cruisers thirteen. The manning of this great additional force will require the limit of the enlisted personnel authorized and will give commands to many officers.—*Nautical Gazette.*

ORDNANCE AND GUNNERY, TORPEDOES.

QUICK-FIRING GUN PRACTICE IN THE BRITISH FLEET.—Following closely upon the issue of the results of the gun-layers' test with heavy guns for 1906, the Admiralty have now published the result of the test of gun-layers with light quick-firing guns and the result of battle practice from torpedo-boat destroyers. In circulating these results for information, their lordships note in both cases their great satisfaction at the very marked improvement in the results as compared with those obtained in 1905. These tests, like those of guns of larger caliber, are carried out annually, and are similar in nature, the target used being 6 feet by 8 feet and the range varying from 700 yards to 1000 yards according to the caliber of the gun. In the case of the destroyer battle practice, officers may render assistance to the men, but the gun-layer is the only person permitted to fire. With each return an abstract of the firing for 1905 and 1906 is given, the following tabular statement being that which is prefixed to the result of the test of the gun-layers with light quick-firing guns in His Majesty's fleet, 1906:

	1905.	1906.
Number of ships that fired.....	86	89
Number of guns.....	1,118	1,421
Number of hits	2,228	4,666
Number of misses	8,291	8,845
Percentage of hits to rounds fired	21.63	34.53
Hits per gun per minute:		
12-pounders	2.12	3.417
6- and 3-pounders (except Vickers)...	1.97	3.358
3-pounders (Vickers)	——	8.144

It will be seen from the above table that the percentage of hits to rounds fired is more than half as much again what it was in 1905, and that the rate of hitting has also improved considerably.

With the 3-pounder guns of Vickers type, mounted in three ships, an average of over eight hits per gun per minute was made, which is indeed wonderful shooting, even when it is remembered that these guns are fitted with the latest pattern telescopic sights. In the order of merit with 12-

pounder guns, the Atlantic fleet stands first, with the *Hindustan* as best ship; and this ship, it is to be noted, was fifth in order of merit in the gunlayers' test with heavy guns. Out of 160 rounds fired with this nature of gun, 98 hits were made, with a rate of 7.64 hits per minute. Four other squadrons were above the average in the 12-pounder firing, these being the Second Cruiser Squadron, with the *Berwick* as best ship; the Third Cruiser Squadron, headed by the *Leviathan*; and the China Squadron, with the *Kent*. The *Kent* and *Exmouth*, of the Channel fleet, tied for fifth place in order of merit; but the best ship in that fleet was the *Glory*, with 64 hits out of 103 rounds fired. The East Indies Squadron, represented by the *Hermes*, the flagship, and the only ship carrying 12-pounders in the squadron, stands last in order of merit, with 19 hits out of 66 rounds fired. Fourteen ships out of 55 which fired with this nature of gun come below the *Hermes*, and a very much larger number have scored under the average. With 6- and 3-pounder guns, omitting the 3-pounder of Vickers type, the Atlantic fleet again stood first in order of merit, the *Majestic* being the best ship in the fleet, with 79 hits out of 150 rounds fired. The *Hindustan* again shows up well, being the second ship in order of merit, with 98 hits out of 190 rounds fired. Of the squadrons, four, in addition to the Atlantic fleet, are above the average. These are the Third Cruiser Squadron, with the *Lancaster* as best ship, 17 hits out of 28 rounds fired; the Cape of Good Hope Squadron, with the *Forte* as best ship, 40 hits out of 110 rounds fired; the Mediterranean fleet, in which the *Diana* and *Minerva* tied; and the First Cruiser Squadron, with the *Hampshire* as best ship. The Australian Squadron is at the bottom, and the best ship in this squadron tied with the *Hermes* and *King Alfred*, these three vessels standing 43 in order of merit out of 84 ships. With these classes of guns, only 31 ships, or a little more than a third, were above the average, and some ships appear to have done very badly indeed. The *Patrol* only made one hit out of 70 rounds fired, the *Alacrity* four out of 64 rounds fired, the *Skipjack*, four out of 30, the *Proserpine* eight out of 77, the *Kent* three out of 18, the *Flora* four out of 36, and the *Drake* three out of 25. This is a great pity in the case of the *Drake*, which has otherwise made excellent firing.

The tabular statement supplied with the result of battle practice from the torpedo-boat destroyers of His Majesty's fleet, 1906, is as follows:

	1905.	1906.
Number of ships that fired.....	57	52
Number of guns.....	342	312
Number of hits.....	653	1,004
Number of misses.....	2,608	1,898
Percentage of hits to rounds fired....	20.02	34.60
Hits per gun per minute:		
12-pounder	1.54	2.43
6-pounder	1.98	3.73

The guns used in this practice are 12-pounders and 6-pounders, and although rather fewer destroyers were engaged and the number of guns fired were less, the number of hits nearly doubled, and the percentage of hits to rounds fired increased by rather more than one-half. The 52 vessels firing are divided between three stations, 12 being in the Mediterranean, 6 in China, and the remainder in the Channel. Those in the Mediterranean came first in the order of merit; the best individual score with the 12-pounder in that squadron was seven hits out of nine rounds in 55 seconds. The China Squadron came next; the best individual score with the 12-pounder was nine hits in nine rounds in 55 seconds. In the Channel there was no firing with the 12-pounder as good as that already mentioned. With the 6-pounder, the best scores were made in the Mediterranean, where two men made thirteen hits, another twelve, and two others eleven hits, each in 55 seconds. The best score with this gun in China was ten hits, and in the Channel eight hits, and some of the firing was very bad

indeed. Out of the 52 vessels firing, only 20, or a little more than a third, were above the average of 37 points. In 14 vessels, no hits at all were made with the 12-pounder. Better firing was made with the 6-pounder, but in several cases not more than one hit per gun was made.—*United Service Institution.*

The splendid shooting of the battleship *Albemarle*, flagship of Rear-Admiral G. Le C. Egerton, Second-in-Command of the Atlantic fleet, in her recent gunlayers' test, under the new and difficult conditions, is the subject of much remark. With 17 rounds from her 12-inch guns the vessel scored 12 hits, nine being bulls-eyes, while with her 6-inch guns she fired 97 rounds, no fewer than 88 hitting the target, the total including 56 bulls-eyes. The battleship *Duncan*, of the same fleet, under similar conditions, fired 12 rounds from her 12-inch guns, making four hits, which included three bulls-eyes and 85 rounds from her 6-inch guns, scoring 66 hits, 32 of which were bulls-eyes.—*United Service Gazette.*

NEW GUNNERY TESTS IN BRITISH NAVY.—The new conditions are published under which the British fleet's gunlayers will be tested in 1907. For light, quick-fire guns and destroyers' battle practice the men will fire for 55 seconds with the ship steaming at 12 knots an hour past a target 6 by 8 feet.

The distance for 12-pounders will be 1000 yards at the start and end of the run and 920 on the beam. For 6-pounders, 3-pounder Vickers and 3-pounder automatic guns the conditions will be the same except that the extreme beam distance will be 800 and 700 yards, respectively. Each ship will be allowed to use any colored sails as targets with a view to getting better results.

The test of heavy guns covers a variety of weapons as diverse as the *Dreadnought's* 12-inch twin turret guns and the old 4.7 quick-fire broadside guns of 1889. In 1906 several ships made such good scores that it became imperative that the conditions should be made more difficult. The Admiralty officials state that in view of the great increase in the rapidity and accuracy of fire generally the target will be reduced in order to train the gunlayers to still greater accuracy of aim at the sacrifice of some rapidity.

Rectangular bulls-eyes are to be painted on canvas of all the old targets. Only bulls-eyes will be counted, but a record of the hits on the canvas outside the bull's-eye will be kept for the purpose of comparison with former years. The bull's-eyes will be 14 feet square for turret guns and 10 by 8 for broadside armament, reducing the danger area by one-half to three-quarters respectively.

In the case of 12-inch and 10-inch turret guns it was found that the use of large cordite charges produced much smoke, the projectile reaching the target before the smoke cleared away and effectually preventing the gunlayer from seeing the fall of the shot, on which so much depended. In order to minimize this difficulty the range is to be increased to 2500 yards at the beginning and end of the run and 2400 yards on the beam.

New gunsighting telescopes of improved pattern have been issued to all ships, thus doing away with the outcry raised when the range was increased three years ago. The telescopes were then of three power only. The new ones are of variable power, going as high as 21 magnifiers. It is not expected that the number of bull's-eyes will be large this year, as the fleet is not used to the new arrangement.—*New York Sun.*

IMPORTANT TORPEDO TRIALS.—Trials took place recently at the torpedo range of Messrs. Whitehead, Weymouth, with a torpedo which was fitted with a new arrangement for heating the air used to propel it. The new heater was designed by Sir W. G. Armstrong, Whitworth & Co., after lengthy experiments. The design was explained to Captain Tanaka, the

senior officer of the Japanese Commission in England. He obtained permission from his government to have an apparatus fitted to one of the torpedoes to be left behind for the purpose from the battleship *Kashima*. The torpedo so fitted was the subject of the trial.

Proposals have for some time past been made to heat the compressed air in a torpedo partly with a view to obtaining more energy out of it, and therefore either higher speed from the torpedo or longer range at the same speed, and partly because the present torpedo is almost useless when the sea water is at a very low temperature, a fact which in a great measure accounted for the large expenditure of torpedoes, without result, during the cold weather off Port Arthur.

The first torpedoes to be fitted with heaters were made in the United States by the Bliss Leavitt Company. Their system was to burn liquid fuel in the actual main reservoir. A torpedo fitted on their system, but considerably modified, was supplied by Messrs. Armstrong to the Admiralty, and went through its trials with success. There was, however, a good deal of apprehension on the part of the torpedo experts on account of the heat being applied to the air in the main reservoir. It was argued that by carelessness or accident a dangerous pressure might be reached, and that if the bursting of so large a chamber did occur, very serious results indeed would ensue. It was on account of these apprehensions that Messrs. Armstrong carried out experiments with the hope of finding some simple means of heating the air in a separate and very much smaller vessel. Their experiments were crowned with more success than they had dared to hope.

It is evident that the amount of weight to be carried by a torpedo must be strictly limited. In order to get as much power out of the engines and as much explosive in the head as possible, the existing torpedo has exceedingly little margin for more weight in the shape of a heating arrangement. To carry a separate vessel in the body of the torpedo, which had to act as a furnace for heating the air as it passed from the main reservoir to the engines, seemed almost out of the question on account of weight alone. Certainly, no torpedo of dimensions anything like the existing pattern could have carried the heating vessel, or combustion chamber as it is now called, which was first experimented with. But as the experiments proceeded it was found possible more and more to reduce the size of the combustion chamber, until at length practical dimensions were reached, and then permission to fit a torpedo was, as already explained, obtained from the Japanese government.

It was shown at Weymouth that a torpedo fitted with a heater could travel for double the distance at a given speed and the same expenditure of air that the torpedo without heater could. In other words, there was a gain of about 100 per cent in power due to the heater. If the torpedo be run for the same distance with a heater as a similar torpedo without a heater, the 100 per cent gain of power would be realized by increasing the speed, and at a range of 2000 yards this increase is from 26 knots to 33.5 knots. This speed of 33.5 knots is the highest which has ever been realized with a torpedo for a range of 2000 yards.

There is no doubt that, if the torpedo were constructed especially to use hot air instead of cold air as at present, the gain in power would be greater, and it has been decided to proceed at once with the designs of a new torpedo.

The experiments were resumed on the following day in the presence of representatives from the Admiralty and the Japanese government. On this occasion the heater was set to give a higher temperature, and a speed of 35.3 knots was obtained for a distance of 2000 yards. This is a gain of 9.3 knots, or 35 per cent, over the 26 knots which can be obtained with a similar torpedo not fitted with the heater for the same distance run. The designers are confident that they can obtain an even higher result by going to a higher temperature. Experiments will shortly be carried out with a view to testing this.—*London Times.*

EFFECTS OF THE JAPANESE RIFLE.—Japan possesses, we believe, the rifle of the smallest caliber of all those that are at present in service. The caliber of this rifle is 6.5 mm. Italy, Roumania, Sweden, and Norway have a rifle of the same caliber. When war was declared it was thought that, notwithstanding its exceptional flatness of trajectory, the immediate effect of the bullet on man was not sufficient to disable him at once, and would allow him to continue in action until put out by the results of the wound. This question was the object of a special study by Surgeon-General Kikouchi upon Russian prisoners, a study of which we give being the free translation:

"The Russian prisoners arriving at Matsouyama for treatment afforded me an excellent opportunity to find out the exact qualities of our new rifle 'Mei-dji,' now used for the first time. As regards the wounds, they in general appear benignant, which furnishes an evident proof in favor of the humanity of a projectile so dreaded.

"I should state here that before the adoption of this rifle by our army I was specially charged by our government with studying its defects and its good qualities. This was not the easiest matter, for naturally I could not ascertain practically the effects of the projectile upon living men. We used in our trials cadavers as well as living animals, and from the results of these experiments I felt I could strongly recommend to the Japanese government this weapon as being an advance over the old one. I affirmed especially that each shot—no matter how slightly it touched any vital part of the body—would immediately disable the man struck, and that, moreover, the percentage of cures would be greater than formerly.

"But soon, in the press of our country, there arose on all sides doubts as to the effects of our small-caliber, jacketted bullet, and when some authorized high-ranking foreign officers appeared in the theater of war and contradicted the statements made by me, I frankly feared for my affirmations. The results of the present war have only confirmed my remarks in a most striking manner, for, besides the enormous penetrative force of our bullet, it is proven that the effect produced upon an enemy when he is struck is sufficient to render him at once incapable of further combat, even when the wounds are of but little gravity.

"On the other hand, the surprising rapidity with which the wounds often heal must be considered as a great step in the direction of humanity. This result comes especially from the fact that the very slender bullet penetrates rapidly without producing great ravages or extended fractures with fragments in the part struck. The greater part of the Russians who have fallen into our hands up to now had received their wounds in the combats on the Yalu. Since then 40 days have elapsed, and improvement has been almost everywhere so rapid, even for those who were severely wounded, that they may be considered as almost cured, and that a great number of them have been discharged as cured. Among them, however, were some men very gravely wounded. One of them, for example, had a lung pierced, and had lost, I estimate, from three quarts to a liter of blood. Now, this man has been discharged this very morning as cured. Another had received a dangerous shot in the lower abdomen; a third had had his left arm, his lungs, and then his right arm pierced; still another had been struck by a bullet which pierced the upper part of both thighs; and many others had received similar wounds. These wounded, surprising to relate, did not die. On the contrary, as has already been said, they are, for the greater part, either well on the way to recovery or completely cured.

"If these wounds had been made with our former Mourata bullet their healing would have been very doubtful and very long. During the Chinese war, 1894-1895, in which we used the Mourata rifle exclusively, wounds of this kind soon become infected and the patient was then lost. Nowadays our diagnoses are almost always favorable, for we do not have to fear grave ulterior complications, except in very small proportions.

"I might even affirm that, in spite of its rapid penetration into the body

struck, and in spite of the slight extent of the wounds, the effect is more rapid upon the wounded than with the old Mourata rifle (a pretty close copy of the Gras rifle). According to my personal observations, and basing myself on my experience in the Chinese war and in the present war, I might even affirm that the Mourata bullet, with slow penetration, did not cut cleanly the veins and nerves which it encountered, but pushed them aside like rubber tubes, leaving the veins intact. This is no longer the case with the Meï-dji bullet, which pierces whatever resists it, and always cuts the veins cleanly, which naturally causes a great loss of blood and soon disables the wounded. Among the wounded Russians there were a great many who had received not one, but up to seven and even more wounds, which made me fear at first that in many cases the wounded man had not been put out of combat until after receiving several wounds. This fact would have corroborated my adversaries. I set to work to investigate carefully these cases, and personally questioned the men who had received several wounds, in order to find out when and how they had been wounded. The result of my investigation was to prove that, with very rare exceptions, the Russians had been laid out at the first shot. With the extraordinary flatness of trajectory of our rifle, these unfortunates, who were in the first line, being neither assisted nor removed by their ambulances, were all the more frequently hit as our troops approached closer to the Russians. They declared that the Japanese projectiles 'shaved' the ground. However frightful these successive wounds may appear, I must, however, say that I was pleased with this explanation, for it confirmed my first explanation.—*United Service Institution.*

MARINE TURBINES AND GAS ENGINES.

GERMANY ADOPTS TURBINES.—It has been announced by the director of naval construction of the German Navy that in the future it will be the policy of that navy to make extended use of steam turbines for the propulsion of ships. Experiments with the cruisers *Lübeck* and *Hamburg*, the former of which has turbines and the latter reciprocating engines, have shown beyond doubt the general superiority of the turbines. It is recognized that there are certain disadvantages, among which are an inability to stop as quickly as the reciprocating engine when running at full speed, and also a present additional cost amounting, so it is said, to about 80 per cent. This latter figure will doubtless be much reduced as turbines become standardized.—*International Marine Engineering.*

FRANCE ADOPTS TURBINES.—The application of the steam turbine to warships is officially announced in France by the adoption of this motor for the six battleships of the new naval program. The Société des Forges et Chantier de la Mediterranée and the Chantiere et Ateliers de Saint Nazaire-Penhoët, being the only firms licensed to construct Parsons turbines in France, will built the motors for all six ships. Each ship will have eight turbines on four shafts, having a total effective horsepower of 22,500. The four screws will each be of 2.8 m. diameter, 2.6 m. pitch, and make about 300 revolutions.—*Le Yacht.*

THE GAS ENGINE FOR HEAVY MARINE SERVICE. (By Lewis Nixon).—It is said of a prominent American statesman that when the pros and cons of expansion were being discussed in a tiresome way, he rose in his seat and said: "But we've done expanded!"

We see much in the press about the possibility of adopting the gas engine for marine propulsion. It is adopted!

Engineers found progress with the steam engine the easier owing to the 15-pounds gain by vacuum, and the fact that the earlier engines were not built to permit of service pressures great enough to make this gain negligible.

The demand upon the steam engine is greater and greater and the last stage is reached in superheating the steam and in the turbine. Steam at 250-pounds pressure is an agent hard to hold in bounds, and the slightest yielding means death by scalding and burning. The engine force of a liner after a trip across the ocean look like battle-scarred veterans.

The turbine requires a very high vacuum for high efficiency and time only will tell how this will work out in service. But even with the best of conditions in steam service—and these conditions have so long been looked upon as necessary evils, that the pitiable life in an engine room receives but little attention—we must still hark back to the man-fired boiler, and it would require a Dante to paint here a real picture of the fire-room inferno.

Horse powers of a thousand in one-cylinder gas engines have been used now for years, and the economy is demonstrated to be superior to the best types of steam engines run under the most economical conditions when newly tested. Many such engines run for months without stopping for repair or overhaul. Simplicity, too, is a feature of the gas engine of extreme importance, and this influences its rapid development in a marked degree.

I know of no fact showing the simplicity more clearly than the general grasp of the automobile engine. This modern miracle of the Twentieth Century, which in comfort gives us on our highways the speeds of a railway train, is having an influence upon the world's progress in that it is bringing about an intimate personal touch with a prime mover and developing an understanding of mechanics which is becoming not only general but popular. The gas engine is easy to understand and control, and hundreds now run them where one can run a steam engine of like power. It helps the farmer cut his wood and thresh his grain and on large farms will soon do the ploughing and reaping.

Many a poor fisherman to whom age has brought waning strength and stiffening joints, finds in the gas motor a ready and easily understood means to continue his usefulness and earning capacity. On suburban lines it gives a flexible and always ready means of transportation independent of a central station and far more economical than electricity in first cost and maintenance. On railway cars it has demonstrated its ability to do as well as the steam-propelled car and it only needs use and further study of the problem to show its superiority.

I am convinced that gasoline and alcohol are the ideal liquid fuels for gas engines for marine purposes on torpedo-boats, destroyers, launches, and scouts, and all other war-vessels of not over 20,000 horsepower where great speed and endurance are required and weight and space must be reduced to the minimum. This is because they are "liquid primary fuels," to use an apt phrase coined by Commander Willets, U. S. N., and can be used without atomizers or producers, so saving much additional apparatus and being always ready for instant application.

The danger, provided we have a proper installation of the gasoline tanks and connections, is far less than with steam of over 200 pounds pressure. We hear of a great many explosions of steam plants of late, especially where deterioration eats up the small margin possible with extreme demand—but think of the accidents which occur unchronicled!

Without going into the dozens of advantages, for an understanding of which I should advise reading the admirable paper of Commander Willets, U. S. N., read before the American Society of Naval Engineers, I will cite the following as the influences that force the recognition and ultimate almost universal adoption of the gas engine in place of the steam engine on the water:

1. Simplicity.
2. Less strain on the engine force.
3. Less weight and space for the same power.
4. Greater economy.

There have been so many errors in stating what has been done and will be done in the near future that a short *resumé* is desirable.

In the first place not one, but *ten* torpedo-boats have been produced, of 35 tons displacement, carrying an 18-inch torpedo tube, a 47-mm. rapid-fire gun and three automatic guns, with a speed of over 20 knots and an endurance of 2000 miles. In proof that no sacrifice was made in scantling to produce results impossible with steam, a vessel of this type was run across the Atlantic in winter gales.

The auxiliary fourmasted schooner *Northland*, of 3000 tons deadweight, has a 500 horsepower engine, and the fishing excursion boat *Arion* a similar engine.

A destroyer has been designed of 625 tons having 12,000 horsepower, and of 30 knots speed.

Another scout destroyer has been designed, of 1800 tons, with 30,000 horsepower and an endurance of 3000 miles at 30 knots, every detail of which is well within the limits of results already proven out.

The producer problem has received the attention of the ablest engineers of the world, as the present wasteful use of fuel with steam cannot continue and the men who give their time and attention to reduce the fuel bill of the world and conserve its latent energy are rendering a service of supreme importance to mankind.

The hard-coal gas producer is now in very general use and is rapidly forcing the steam plant aside, especially in factory plants.

The soft-coal producer is giving good results but must be further developed.

The next important development will be a simple and easily manipulated crude-oil gas producer.

With its coming as a commercial product we shall see the gas engine in future tramps, and with the advent of the first passenger liner its universal adoption on transatlantic passenger steamers will be assured.

Whether the steamer will be made smaller or not is hard to say, but very probably on account of the greater steadiness and the lesser influence of waves the vessels will continue to grow.

One hundred thousand horsepower can be installed in the space and on the weight of 45,000 horsepower of steam as put on a modern liner. The consumption of crude oil will be about 750 tons per day for such power.

The largest marine engine yet designed on proper proven-out data that I have knowledge of is a six-cylinder double-acting engine, 33-inch diameter by 33-inch stroke, developing 5000 horse at revolutions less than 200—but far larger units are in use on shore, and their application on water is an easier problem than on land.—*Engineering Magazine.*

That Mr. Nixon had begun the construction of a boat to cross the Atlantic in four days was a chance reference he made last week in a speech at Tottenville, S. I. Later he said: "The reference to the vessel which should be able to cross the Atlantic at a rate more rapid than any craft yet built was made before a gathering of men interested in the development of Staten Island, not only as a place for residence, but as a site for manufacturing. The Standard Motor Construction Co., builders of gas engines on the Riotte patents, of which company I am president, has recently acquired a tract of about 12 acres in Tottenville upon which it will erect a plant to take care of the orders which now overtax the capacity of the Jersey City factory. The new factory, with water front and basin, will be devoted to marine work. In explaining that I did not propose to build vessels there I referred to some of the things that I intended to do in the near future. I have built every type of boat from submarines to a boat for Arctic rivers drawing only six feet of water; vessels driven by sail, by paddles and from one to six propellers; armored vessels and the lightest of racers; the *Gregory*, the first motor-boat to cross the ocean, and I said that now I intended to build one more boat of an advanced type before I

stopped building ships and that is a boat to cross the ocean in four days, and that while the hull could not be built in Tottenville the engines would be.

"Such a vessel one year ago was an impossibility. To-day it is perfectly feasible. No vessel propelled by steam engines will ever cross in that time, but the striking development in the gas engine enables us to bring about such radical reductions in weight of machinery and fuel that it is a simple engineering problem. The engine of the future and very near future at that is the internal combustion engine.

"Destroyers of 30 to 33 knots are in existence, but they have practically no endurance—at full speed but two or three hundred miles. My new boat has an endurance of 3000 miles at 33 knots, and over 16,000 knots at cruising speed. The horsepower is about 30,000, the displacement less than 2000 tons. The Atlantic liner propelled by the gas engine will come as a demand of enlightened engineering progress. This is not a prophecy, but a sober conviction based upon results already accomplished."

Mr. Nixon said that the keel of the new warship will be laid in his yard in Perth Amboy, N. J.—*Nautical Gazette.*

Experiments in England with a 60-foot torpedo launch propelled by internal combustion engines of the Napier design, built by Yarrow & Co., have demonstrated that such a boat can be depended upon for service under very adverse conditions. After considerable experimenting in smooth waters, the boat was taken out into the open sea and given a trial in very rough water. It covered 176 nautical miles 202 statute miles) in 7 hours 11 minutes. The mean speed was 24.5 knots, or 28.2 miles per hour. There was a crew of six men. The petrol (gasoline) consumption during the run was 220 gallons. As the tanks have a capacity for 350 gallons of fuel, it follows that the radius of action at full speed is about 280 nautical miles. The engine is stated to have run very well, not having been stopped from start to finish of the trial.—*Iron Age.*

NAVY'S FIRST GASOLENE MOTOR.—The preliminary test of the first gasolene motor ever designed or built in the navy was held in the machine shop of the Steam Engineering Department at the Navy Yard, Norfolk, Va., March 18. So far as it went, it was entirely satisfactory, though the full test was not completed as to power. The motor is intended for installation in sailing launches, and for low speed traffic. It is of compact and light, yet durable construction, and contains many novel features. It was designed and built under the supervision of Com. A. B. Willits, U.S.N., head of the Steam Engineering Department of the yard.—*Norfolk Landmark.*

GAS ENGINES FOR WAR VESSELS OF THE FUTURE.—In London last week the members of the Institution of Naval Architects held a meeting, and one of the most important papers, if not the most important paper, read and discussed was one which dealt with "The Influence of Machinery on the Gun Power of the Modern War Ship. This showed that if a large number of guns are to be effectively mounted they must all be placed so as to fire on either broadside. In the *Dreadnought* out of ten 12-inch guns only eight fire on either broadside. To enable all ten to fire with the utmost effect it was shown that funnels must be abolished and also all deck erections. But if funnels are to be eliminated steam can no longer be used and the boiler must go. The firm of Vickers have faced this fact and after three years of almost continuous research-work have now perfected a system of gas machinery for propelling a ship. An explosive engine, in a word, is to displace the steam engine. The design for such a vessel has been worked out. She has no funnels. Her speed will be greater than that of any existing battleship. Her dimensions are moderate,

but she carries batteries more powerful than even the *Dreadnought*, since all of her ten guns can fire on either beam, and six ahead or astern. This is to be the ship of the future.

Admiral Sir E. Fitzgerald, who opened the discussion, deprecated the adoption of too hasty generalization from the result of one battle, meaning that of the Sea of Japan. He remembered the battle of Lissa, and because one vessel was rammed and sunk there every war ship for thirty years was fitted with a monstrosity on the bows called a ram, which in these years had sunk many friends, but never a foe. With regard to the adoption of oil as fuel, he wondered what would happen if a shell entered the oil reservoir. The oil would all run out, if it did not explode, and the ship would be left without fuel, or, if the oil in one set of tanks escaped, with a heavy list to one side. Admiral Sir G. Noel said that if the marine gas engines foreshadowed could be produced there was no doubt that they would be of great value, because they would give ships higher speed and a much wider radius of action.

Admiral Sir E. Fremantle remarked that there could be no question of advantages which would ensue if a battleship's decks could be cleared of the encumbrance of the funnels, upstakes, and similar appliances necessary with steam engines. One of the things which would result would be that ships would not be liable to sudden reduction of speed from the destruction of their funnels. Internal combustion engines would get rid of that, but it was usually found that with all the improvements introduced there was generally an increased possibility of damage and disaster.

Sir William White pointed out that in attempting to reduce the diameter, and therefore, the weight, of turrets, the exposed portion of the guns was liable to destruction. At the battle of Tsushima this portion in some cases had been shot entirely away. With regard to oil or gas engines, he believed that their day was coming.

Lieutenant A. T. Dawson believed that the advent of gas engines for marine use was nearer than Sir William White and many more appeared to realize.—*Nautical Gazette.*

COMPARATIVE ECONOMY OF PRODUCER GAS AND STEAM.—It is known in a general way that a good producer-gas engine plant will yield a horsepower upon about one-half the amount of fuel that is necessary to generate one horsepower with a steam plant. The relative efficiency of gas and steam has recently been made the subject of analysis by a well-known pioneer in the field of producer gas, J. M. Emerson Dowson, who bases his comparison upon a steam and gas power plant, each of a capacity of 250 horsepower. In the case of the steam plant, he finds that of 1120 heat units contained in the fuel, 224 units are lost in radiation, flue gases, ashes, etc., and that 896 units appear in the steam that is generated. Of this amount, 112 units are lost by condensation in the pipes, etc., leaving 784 units that are supplied to the engine. Of these, 667 units are lost in the exhaust, leaving only 117 units to be converted into work in the engine. Of these, 17 units must be deducted for engine friction, leaving only 100 units, out of 1120 originally in the fuel, available for useful work on the engine shaft. In other words, in order to obtain 100 heat units in useful work on the shaft of a steam engine, there must be 1120 heat units in the fuel burnt up in the boiler. A similar investigation of the producer-gas plant shows that there need be only 525 heat units in the fuel consumed in the producer to give 100 heat units of useful work on the engine shaft. In the producer-gas engine 105 units will be lost in radiation, etc., from the gas plant; 126 units will be lost in cooling the engine; 177 will be lost in the exhaust, and there will remain only 117 units to be converted into work in the cylinder, of which 17 will be lost in engine friction, finally leaving 100 units to perform useful work. This comparison shows a saving in fuel of 53 per cent in favor of the producer-gas plant. A comparison by the same authority of two 40-horsepower plants, gas and steam, shows a

saving of 70 per cent in favor of the gas plant. Excellent as is the economy of the gas plant as shown by these figures, it must be noted that the heat losses are still very large, and future improvement in economy must be looked for mainly in this direction, both in the gas plant and in the engine.—*Scientific American.*

RADIO TELEGRAPHY.

ATLANTIC WIRELESS.—The Marconi Company is about to make some important developments in its wireless telegraphic system. It has arranged to install a special station at Clifden, on the west coast of Ireland, and by that means to establish a direct connection with the United States. Tests have already been made, and are said to have yielded satisfactory results. The system has in some important respects been improved upon, providing for a much more distant transmission. At Poldhu the etheric impulses are dispatched into space from a number of lattice work aerials. At the new station on the west coast of Ireland metal plates will be used instead of wires stretched over the lattice work.—*Electrical World.*

RADIOTELEGRAPHY BY CONTINUOUS ELECTRICAL OSCILLATIONS.—Recently Mr. Valdemar Poulsen, of Copenhagen, gave a splendid demonstration of his new system of radiotelegraphy in London, of which *Engineering* publishes the following report:

Wireless telegraphy, Mr. Poulsen said in introducing his discourse, made use of the waves generated by a sparking oscillator. These waves were strongly damped; they began with great amplitude, somewhat like the explosive sound waves produced by a pistol shot, and died out rapidly. Undamped waves continued for a longer period with uniform amplitude; but it was only in 1900 that Duddell—in a remarkable discourse, delivered before the Institution of Electrical Engineers—had shown how to produce such continuous electric waves suitable for radiotelegraphy with the aid of his singing arcs. The problem had, indeed, not been far from being solved by Duddell. (Duddell's arrangement is indicated in Fig. 1.) When an alternating circuit containing capacity and self-induction was coupled in parallel with an electric arc fed by direct currents, the arc became musical under certain conditions, and an alternating current was produced in the alternating circuit, having the same rate of vibration as the note of the arc. Duddell had in this way obtained frequencies of 30,000 and 40,000, very high for electrical engineers, but far too low still for radiotelegraphy. Three and a half years ago Mr. Poulsen had commenced to study the question of how the frequency could be raised, and he had found that arcs burning in atmospheres of hydrogen or coal-gas and some other gases gave frequencies of about 1,000,000, which would yield us the wave-length of about 300 meters suitable for wireless telegraphy. He had first made the arc burn in alcohol vapor merely by placing a spirit lamp directly under the horizontal arc. The superiority of hydrogen might be due to its thermal and electrical properties, its high atomic velocity, and its great cooling power. (Mr. Poulsen did not dwell on this point.) As the velocity of sound in gases is by Newton's law, which later researches have only modified, proportional to the square root of the quotient: elasticity over density, we should expect more rapid vibrations in hydrogen, and that gas would propagate sound about four times as quickly as air. Mr. Poulsen, however, spoke mainly of the cooling effect of hydrogen, and the fact that it is advisable to cool the arc electrodes supports this argument. The anode could, he said, be made of a copper tube (Fig. 2) through which water circulated; the arc would then spring from an exchangeable ring at the end of the tube. The cathode was carbon. When both electrodes consisted of carbon (Fig. 3), the cathode might grow by deposition of carbon on it, and in order to insure a clean, sharp

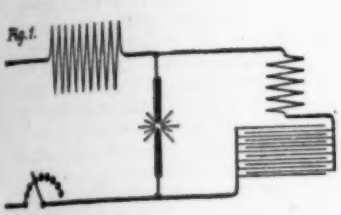
edge, the cathode was very slowly rotated at a circumferential speed of 0.1 millimeter per second; the anode was cut off obliquely as in Fig. 3, so that the arc always played between the upper edges. The arc was produced in a box made of marble; all the dimensions of the boxes shown were considerably less than 1 foot. Stout solid carbons were used.

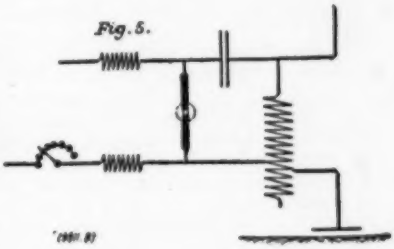
A mixture of hydrogen and coal-gas, Mr. Poulsen continued, answered still better than hydrogen. Carbureted hydrogen or coal gas was constantly fed into the box; the smell noticed on Tuesday rather suggested the formation of acrolein. Nitrogen also gave higher frequencies than air; ammonia was also effective, but objectionable (prussic acid is formed). Oxygen seemed to be the obnoxious element, probably because it gave rise to combustion of the carbon. The arc had to be adjusted to a certain "active" length, which increased with the current intensity and decreased with higher frequency; self-induction and capacity could be varied considerably. The usual active length of the arc was only 3 millimeters. In order to produce a greater potential gradient in the arc and to steady it, the arc was placed in a magnetic field, whose coils, branching from the main circuit, served also as choking coils. Fig. 4 explains the arrangement, and, further, the peculiar cross-connection adopted with the object of doubling the potential gradient. A single arc on a 450-volt circuit had produced 160,000 oscillations per second and an oscillating energy of 1200 watts. The same arc oscillating at 240,000 vibrations would yield oscillation energy at 900 watts. The proportion of continuous-current energy which was converted into oscillation energy was diminished when the frequency was raised, as the figures just given would indicate. Higher current intensity would increase the energy of oscillation only up to a certain maximum intensity. If more energy were required, several arcs could be connected in series; this had been done in the laboratory, but in practice one arc had so far sufficed, even in sending messages from Copenhagen to North Shields.

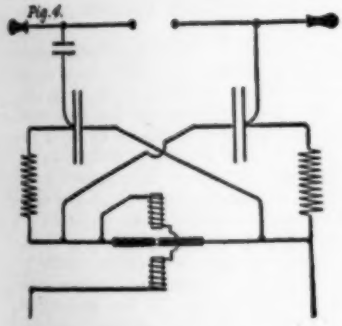
Successful demonstrations of resonance were interposed at this stage. A small circuit, comprising an arc in illuminating gas, was radiating. About a yard from it was a coil, say, 15 inches high, 6 inches in diameter (larger coils were also used) consisting of very fine copper wire, tuned to 700,000 oscillations per second. When the generator was tuned to the same period, a vacuum tube in the secondary circuit began to glow; but the approach of Mr. Poulsen's hand, or a slight alteration of the variable condenser, sufficed to disturb the glow. From a larger coil beautiful ramified discharges spurted out; when a metal rod was brought near, this ramification changed into a quiet flame. Then a fine copper wire was twisted about the core of the coil, so as to leave a wire tail pointing upward. As soon as the system was excited, the fine wire was seen to whirl round, describing a luminous cone. A Tesla transformer with 3000 turns gave a very beautiful flame discharge.

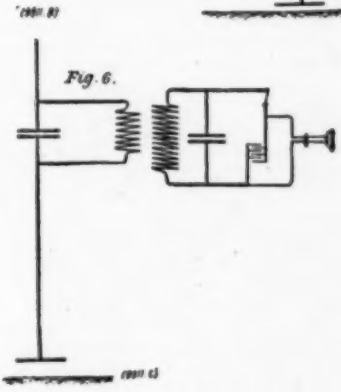
Passing to a description of the station outfit, Mr. Poulsen showed their favorite transmitting arrangement, which is illustrated in Fig. 5. The antenna and its counter capacity might be made to act as the oscillation circuit comprising the arc in which case the oscillations would be created in the antenna itself. Or the energy might be supplied to the antenna from a primary generating circuit by means of a coupling which might be close to loose, as in spark telegraphy. If the coupling were neither absolutely loose nor absolutely close, the frequency of the system would not be sufficiently defined, since the arc might develop one or two not very dissimilar periodicities. In the arc-wave system perfect tuning could be realized with both loose and close coupling, while in spark telegraphy a loose coupling was essential. In Fig. 5 the coupling was close—that is to say, the inductance is directly joined to the antenna, and also to the generating circuit, at a point near a loop. Signaling could be effected by various methods. To vary the length of the wave, apparently the simplest method was not advisable, because the transmitting apparatus of each station would

have to be characterized by two wave-lengths, and the number of stations which could operate simultaneously over the same territory, without mutual interference, would be reduced by one-half. According to another method, the telegraph key connected and disconnected the antenna and its counter capacity to and from the rest of the system; to protect the generator, a compensating oscillating circuit of weak radiation was introduced every time the key broke the antenna circuit, or the key could throw in resistance in the generator or antenna circuit. This last method was very simple and spared the contacts best. Other ways of inserting damping could also be resorted to, varying the length of the arc, the magnetic field, the gas feed, etc.









For the receiver perfect resonance and, therefore, loose couplings were indispensable. But as the waves were continuous, the detector need only form an intermittent part of the oscillating circuit. There would be no damping by the permanent inclusion of the detector then. The Pedersen "ticker" receiver (Fig. 6) operated as follows: The oscillation circuit was permitted to get well into action, undisturbed by damping; then the detector would suddenly be inserted and absorb the accumulated energy; the detector, consisting of an electrolytic cell, a thermo couple, or a bolometer connected to a telephone, would then give a musical note. The oscillation circuit of Fig. 6 contained a condenser which was intermittently shunted by a condenser of larger capacity placed in parallel to the tele-

phone. The intermittent contact-maker, or "ticker," was a small electromagnetic vibrator like a Neef hammer; the contacts consisted of two hooks of gold wire, fixed at right angles to one another. German silver, or silver and steel, would make the telephone sound louder, but they were not so reliable as gold and platinum. This intermittent operation of the receiver, which embraces some feature of multiplex telegraphy, seems to us—if we understood rightly—to be one of the most important advantages of the system. In spark telegraphy, the energy is stored up in the transmitter until a powerful spark discharge takes place; here the receiver energy is stored up. The capacity of the receiver system, the lecturer continued, was determined both by the condenser proper and the comparatively small and slowly varying capacity of the intermittent contact; this proportion of the capacities was a technical advantage, as it would allow of slight variations in the transmitted wave without any failure of the receiver being risked. As Morse signals consisted of dashes and dots, it was obviously to the purpose to introduce a "ticker" if a telephone receiver was to be used, as they did. The bolometer or thermo-couple, which would only momentarily enter into the oscillation circuit, might itself be in a tertiary circuit; apparatus of this kind, comprising a Pedersen ticker designed particularly for combination with a coherer, were explained by diagrams.

Coming to results, the lecturer pointed out that a spark-telegraphy station could, with very little alteration, be transformed into a Poulsen station. The sharpness of tuning with which stations could be worked without mutual interference was in practice about 1 per cent—*e. g.*, stations A and B might work with waves of 600 meters, and C and D work over the same territory with waves of 606 meters. It should be mentioned that similar claims are made for spark-telegraphy apparatus. They had received with the aid of three receivers, all coupled to the same antenna, simultaneously three different telegrams, the three wave-lengths differing by about 4 per cent. As the generator gave out a spectrum of waves with wave-lengths ranging from 300 to 3000 meters, several hundred stations might be worked over the same territory. The greater wave lengths carrying greater energy should be utilized for the larger distances, and the higher antennæ should be reserved for them.

Their first transmitting station had been erected at Lyngby, near Copenhagen,* in June, 1905. Their first receiving station had been nine miles from Lyngby. Another station was then built in the port of Esbjerg, 180 miles from Lyngby across the Danish Isles and Jutland, on the west coast of Jutland. With a consumption of energy of 800 watts, a radiated energy of 100 watts, a potential difference of a few thousand volts between the antenna and the earth, and wave-lengths of 700 or 1000 meters, good telephone signals had been obtained at Esbjerg; by strengthening the magnetic field of the arc, the radiating power had been raised to 400 watts.

When on one occasion they had fitted up this station at Esbjerg to receive spark-telegrams, the receiver had given out an inextricable jumble of English and German signals from ships and shore stations, further complicated by the interposition of atmospheric discharges. When they tuned up for Lyngby again, communication with Lyngby had at once been restored without the slightest disturbance from extraneous sources. Three masts had been erected at Lyngby, of which two were used as a rule. The wire fan was suspended from a rope connecting the two masts. With a power of one kilowatt, and a mass 100 feet in height, they had recently established perfect communication between Copenhagen and North Shields, a distance of 530 miles, 150 miles of which was overland. That result strengthened Mr. Poulsen's belief that 10 kilowatts should suffice to send radiotelegrams across the Atlantic. Concluding, the author summed up

* There are three Lyngbys in Denmark; the one referred to is not the largest.

the chief advantages of the system: Extreme accuracy of tuning, rendering multiplex telegraphy available to an almost unlimited extent; non-interference with other lines; increased freedom from atmospheric disturbance; greater efficiency and economy, because the losses by leakage and by brush discharges would be smaller with the lower potentials. There were also great possibilities for wireless telephony.—*Scientific American.*

MISCELLANEOUS.

TORPEDO BOAT STRENGTH OF NAVAL POWERS.—Torpedo boat destroyers and torpedo boats, which are merely large and small editions of the same thing, with a very indefinite line of demarkation between them, are being built in large numbers by all the naval powers. At the end of 1906 there were in service or under construction no less than 1877 vessels of this character, ranging from the smallest size up to 800 tons displacement. The table shows how the eight leading naval powers are supplied, the order being that of general naval rank:

			—Average—		Over 200 tons each.	
	Number.	Tonnage.	Tons.	Speed.	Number.	Tons.
Great Britain.....	261	70,701	271	27.5	160	62,022
United States.....	52	12,463	240	27.4	26	9,097
France	438	51,295	117	25.6	64	20,645
Germany	106	30,730	290	26.5	61	24,184
Japan	129	26,221	203	27.9	52	18,886
Italy	184	23,772	129	26.0	49	13,733
Russia	202	32,232	160	24.9	59	19,932
Austria	113	14,632	129	24.1	38	10,090

The remaining 392, amounting to 39,965 tons, or an average of 102, are divided among 17 nations, of whom only nine possess more than a score each. Omitting from consideration all vessels of under 50 tons displacement, and all of under 22 knots speed, as being of comparatively small service, the eight powers have left a force as shown in the second table:

			—Average—		Over 28 knots.	
	Number.	Tonnage.	Tons.	Speed.	Number.	Tons.
Great Britain.....	192	66,488	346	28.0	78	29,916
United States.....	46	12,030	262	27.7	25	8,401
France	294	42,865	146	26.6	58	17,283
Germany	96	28,970	302	26.8	31	12,610
Japan	103	24,695	240	28.4	56	18,496
Italy	146	22,769	156	26.3	25	8,693
Russia	122	27,020	221	25.9	10	2,922
Austria	44	10,261	233	26.6	9	3,510

Of torpedo vessels over 200 tons, England has 160; France, 64; Germany, 61; Russia, 59; Japan, 52; Italy, 49; Austria, 38, and the United States but 26. England's superiority is here very marked—*Iron Age.*

THE COST OF NAVIES.—A most useful return, in the form of a Parliamentary paper, has been issued by the Admiralty showing the expenditure of the great Powers on their fleets, arranged on a common basis, so as to obtain a real standard of comparison. This shows the naval expenditure in the financial year 1905-6 to have contrasted as follows:

	Total expenditure.	New construction and armaments.
Great Britain	£29,593,635	£11,291,002
France	12,151,815	5,739,230
Germany	11,128,655	4,968,738
Russia	12,249,552	4,576,370
Italy	4,636,026	2,387,082
United States	24,444,948	11,374,876

It will be seen that in this year the United States spent a larger sum on new men-of-war than even Great Britain, but that we spent more than twice as much as any two European powers. The return also shows the tonnage of the new ships launched by each country in the past ten years:

	1898-1901.	1902.	1903.	1904.	1905.
Great Britain ..	696,275	89,465	155,225	85,880	105,360
France	234,806	45,956	31,142	45,318	31,381
Germany	205,829	30,119	64,340	44,072	33,936
Russia	218,276	52,265	45,010	5,138	20,416
Italy	82,008	650	12,425	13,373	14,555
United States ..	146,273	37,445	84,206	161,150	74,000

During the last three years Great Britain has put afloat vessels aggregating in completed displacement 346,465 tons, while the United States in the same period has launched ships of 219,356 tons, Germany 142,348 tons, France 107,841 tons, Russia 70,554 tons, and Italy 40,353 tons.—*United Service Gazette.*

COMPARISON OF LOSSES IN RUSSIAN AND JAPANESE ARMIES.—The present is a comparison made by the *Ruskii Invalid* between the Russian and Japanese losses, the latter having been published in the *Semaine Médicale*, and which deal with the period between February 1, 1904, and November 1, 1905.

The following were attended in hospital: Russian Army, 333,411, or 224.25 per 1000; Japanese Army, 334,073, or 220.51 per 1000. The slightly greater liability to disease of the Russian Army is easily accounted for by the fact that it operated in a climate with which it was unfamiliar, whilst the Japanese found themselves under much the same conditions as in their own country.

There died of disease: Russian Army (in the hospitals) 6947, (before entering hospital) 1013, total, 7960, or 2.38 per 1000; Japanese Army, 21,802, or 6.52 per 1000. The mortality from disease was, thus, in the Russian Army about a third that in the Japanese. If a comparison is made of the loss in killed and wounded in the Russian Army, the following results are obtained:

Killed or died of wounds before entering hospital, 20,233, or 24.82 per 1000; wounded cared for in hospital, 111,777. The proportion of killed to wounded is 1 to 5.52 or in other words, to every 100 men killed, 552 were wounded. If the Russians missing are included in the proportion of those killed and wounded, the following results will be obtained for the Russian and Japanese Armies:

Russian Army.—Killed, 26,308, or 19.27 per 1000 of the total effective; wounded, 145,317, or 106.48 per 1000.

Comparison of killed to wounded was 1 to 5.92; number of wounded died in hospital, 3402; percentage of mortality from wounds in hospital was 3.04.

Comparison of deaths from wounds to deaths from disease was to .27, viz., to every 100 men killed or died of wounds, 27 died of disease; 20.03 per 1000 wounded men were discharged as incapacitated from service. Comparison of death from wounds to that from disease was 100 to 73.

Japanese Army.—Killed, 47,387, or 31.27 per 1000 of the total effective; wounded, 173,425, or 114.47 per 1000.

Comparison of killed to wounded was 1 to 3.06; number of wounded died in hospital, 11,425; percentage of mortality from wounds in hospital, 6.53.

Comparison of deaths from wounds to deaths from disease was 1 to .37, viz., to every 100 men killed or died of wounds, 37 died of disease; 21.53 per 1000 wounded men were discharged as incapacitated from service. Comparison of death from wounds to that from disease was 100 to 99.

Epidemic diseases were more frequent in the Russian than in the Japa-

nese Army: Russian Army, 34,205, or 25.05 per 1000; Japanese Army, 27,158, or 14.39 per 1000.

It should be mentioned that in these last figures the number of Japanese who suffered from beri-beri is not included, and these, according to the *Semaine Médicale*, amounted to 59,055, or 38.98 per 1000 of the total effective. In the figures quoted above, information relative to the garrison at Port Arthur is also not included.—*La France Militaire.*

ROYAL UNITED SERVICE INSTITUTION.—The sixty-seventh annual meeting of this institution was held under the chairmanship of Major-General Sir G. H. Marshall, who, in moving the adoption of the report, stated that the total number of members at the end of the year was 5404, showing an increase of 35 on the number recorded at the end of 1905. The Council had increased the investments by £1000, and had transferred from investments £2000 for the purpose of forming a general reserve fund for renewing the lease of the building in 66 years' time, when the present lease expires. Colonel W. A. Hill, in seconding, said the revenue account for the year showed a debit balance of £717, which was due mainly to the necessity of having to carry, in accordance with the by-laws, the life subscriptions to capital, and partly to the publication of the special prize essays in the journal, and to the printing of the same in the form of a pamphlet for sale. But for these special items and the loss of interest on the £2000 carried to reserve, there would have been a surplus revenue of £230. The motion was carried.

The Gold Medal of the institution, together with the first Trench-Gascoigne prize of thirty guineas, for the naval essay, 1906, was awarded to Lieutenant B. E. Domvile, R. N. The second Trench-Gascoigne prize of thirty guineas was given to Lieutenant N. F. Usborne, R. N. The essay by Lieutenant E. V. F. R. Dugmore, R. N., was placed third by the referees. The subject was, "What is the relative value of speed and armament, both strategically and tactically, in a modern battleship, and how far should either be sacrificed to the other in the ideal ship?" The referees were Admiral Sir G. H. U. Noel, Rear-Admiral R. L. Groome, and Captain G. A. Ballard, R. N.—*United Service Gazette.*

COAL-STORAGE UNDER WATER.—In 1902 the Western Electric Company decided to provide for the storage of a considerable amount of fuel. As experience with coal bunkers at one plant showed very clearly that the Illinois coals, which the company makes use of, when stored in ordinary bins exposed to the air, suffered materially from spontaneous combustion, it was decided to try storing a large quantity of coal under water. This was carried out with satisfactory results, as no trouble has ever been experienced there from spontaneous combustion.

When it was decided to provide for a large storage of coal at the new plant at Hawthorne, Ill., the same scheme was followed, and a storage pit, built of concrete, divided up into three sections and covering a ground area of about 310 by 114 feet, was decided upon. It is arranged for filling with water so as entirely to cover all the coal that may be placed in it. As constructed, each section is approximately 15 feet in depth, and the whole pit has a capacity of about 10,000 tons, which reserve is kept exclusively for emergencies.

Coal cars may be emptied into or loaded from the storage pits while on any one of five tracks. A locomotive crane, fitted with a grab bucket, is provided for taking the coal out of the storage pit. No provision is made for drying the coal before use, as the handling of the coal will result in its being dry enough by the time it reaches the boilers.—*Engineering and Mining Journal.*

SUBMARINE SIGNALLING BY SOUND.—The recent experiments in submarine signalling by sound, carried out by H. M. ships *Antrim* and *Spanker*,

will have gone a long way towards solving the very troublesome problem involved in signalling between lighthouses, or lightships, and passing vessels in foggy weather. It will also, no doubt, help towards solving the further problem involved in the avoidance of each other by ships under way in such weather. Every seaman, and even every landsman, who has crossed one of our large rivers in time of fog, is familiar with the absolute uselessness of the present system of signalling. It is a familiar experience for a pleasure steamer to be suddenly held up by a fog, and to grope its way very cautiously, and really in great danger, to it pier, to discover on arrival there that horns, bells, and other contrivances had been vigorously manipulated ever since the fog appeared. To seamen navigating the English and Irish Channels, the North Sea, the Banks of Newfoundland, and other foggy places, the experience has been often almost heart-breaking. It is well-known that the fog horn on St. Catherine's Point is worked by something like 100 horsepower, and is often inaudible within a very short distance indeed. It need hardly be mentioned either that every system of signalling, or of making known the presence of lighthouses, or of ships to each other, by means of lights, during fogs, has utterly failed. Apparently none of the light waves we are cognizant of at the present time, and none of the sound waves, will penetrate fog for more than a very short distance.

With submarine sound signalling, however, the whole of the conditions are changed. Water, and particularly sea water, is a good acoustic conductor. It is a common experience when bathing, for instance, at mineral baths, where pumps are often employed, to hear the strokes of the pump when one's head is under water, whilst they are absolutely inaudible under other conditions. The system of sound signalling is based upon this fact: A powerful bell is struck with heavy blows, the strokes on the bell being made to signal certain definite numbers, just as revolving and flashing lights do, and the signals are read by the aid of microphones and telephone receivers. There are two distinct pieces of apparatus required—a bell of about 140 pounds weight (this size having proved the most satisfactory from repeated experiments), with a clapper whose weight varies from 1¼ cwt. to 3 cwt., and which is made to strike the bell by compressed air. The bell is suspended by chains at a depth of about 20 feet from the surface of the water. In the recent experiments carried out by the Admiralty, the bell was suspended from the cathead of the *Spanker*, and its depth varied from 16 feet to 24 feet, as the ship rolled. The compressed air is carried to the bell by a flexible pipe, and is operated from inboard, a chamber attached to the upper part of the bell containing the piston that is actuated by the successive impulses of the compressed air, and which in its turn actuates the clapper. The receiving apparatus consists of a microphone, suspended in a tank containing a fluid of a certain density that has been discovered by experiment, the tank being fixed to the side of the ship on the inside, and wires being led from the microphone to a battery and receiving telephone.

There are two receiving apparatus fixed, one on each side of the ship, and it was found in the experiment between H. M. ships *Antrim* and *Spanker*, that the microphone, say on the port side, responded to the signals from the bell when the *Spanker* occupied any bearing, from half a point on the bow to half a point from right astern, the microphone on the starboard side being silent when that on the port side responded. As the *Antrim's* head swung towards the *Spanker*, so that the bearing of the *Spanker* gradually changed from right abeam to right ahead, the response of the microphone on the port side changed, and at half a point on the port bow it ceased. When the *Spanker* bore half a point on the starboard bow the starboard microphone commenced to respond, and continued to do so as long as the *Spanker*, which represented the lightship, was on her starboard side. It was therefore quite easy to determine the bearing of the *Spanker* from the *Antrim*, and it would have been easy to determine

the bearing of a lightship or lighthouse by noting the bearing at which the port microphone ceased to respond, and the bearing at which the starboard microphone took it up, the bearing of the lightship being half-way between these.

It appears to the writer that the matter is capable of extension, though details will necessarily have to be worked out, to signalling between ships in foggy weather, the sound signals taking the place at present occupied by ships' lights at night, and ships approaching each other would be able to read each other's courses, and to avoid collision, just as easily, in the heaviest fog, as they now can by the aid of the ordinary ships' lights on a clear night. It should be a comparatively simple matter to arrange two distinct sources of sound—one carried, say, on the starboard bow, and the other on the port bow. A bell and a foghorn, for instance, could hardly be mistaken for each other, and the bell and the foghorn would take the place of the red and green lights used by ships at night. Every seaman knows that when he sees a red and a green light right ahead, a ship is approaching him end on, and he knows that he has merely to port his helm to clear. Also he knows when a red light is reported on his starboard bow, that a ship is crossing his bows from starboard to port, and that it is his duty to keep out of the way, which he does by porting his helm. On the other hand, when a green light is reported on his port bow he knows that a ship is crossing from port to starboard, that it is the duty of the green light to keep clear of him, and that it will do so by porting its helm. In the case of the green light he can watch the ship turning in obedience to her helm, by watching her lights. As she turns the green light becomes more and more clear, then the red light commences to show, becomes more and more visible, and finally the green light disappears. A similar arrangement would hold with signals given by sound, as explained. Supposing the port signal to be a bell, and the starboard signal a foghorn. If a bell was reported on the starboard side the officer of the watch would know that a ship was crossing from starboard to port, that it was his duty to keep clear, and he would port his helm. If a foghorn was reported on the port bow he would know that a ship was crossing from port to starboard, and that it was his duty to keep out of the way. The crossing ship in each case would know by the signals of the ship it was meeting how it was steering, just as with the red and green lights. In the case of a ship approaching end on, both signals would be reported on their respective sides, and each officer of the watch would know that each had to put his helm to port. A question that may arise is the behavior of the bell, or foghorn, in a sea way, but as every seaman knows, fogs do not occur when there is a heavy sea. There is also the question of speed of signalling, but here again it is an axiom with seamen of all nations to go slow in a fog.—*United Service Gazette.*

SUBMARINE SIGNALS IN THE UNITED STATES.—The United States Light-House Board has arranged with the Submarine Signal Co., of Boston, Mass., to equip with submarine bells all important lightships not already equipped. This includes the light-vessels south of Hatteras; those on the Great Lakes, and those on the Pacific Coast. The Point au Pelee Lightship, *Lake Erie*, which is maintained by the Lake Carriers' Association in Canadian waters, has been equipped; and work is in progress on Bar Point (head of Lake Erie); Lake Huron and Poe Reef (Lake Huron); Gray's Reef, White Shoal, Lansing Shoal and Eleven Foot Shoal (Lake Michigan). These vessels will be ready when they go on the station at the opening of navigation. The Pacific Coast light-vessels will be equipped as opportunity offers. The five new light-vessels now building will be supplied with submarine bells before leaving the shipyard. In short the entire coast of the United States is to be protected by submarine signals; and Canada having made similar arrangements, all North America waters will soon have the advantage of such protection.—*Nautical Gazette.*

TURBO-ELECTRIC ENGINES FOR SHIPS?—The reciprocating steam engine has apparently reached the limit of its efficiency in the propulsion of ocean-going ships. The present indications are that the marine engine of the future will be either the steam turbine or the perfected producer-gas engine; with a strong probability that the latter, because of its excellent fuel economy, will be the preferred type.

There is, however, a third system of propulsion which theoretically, at least, has so much to recommend it that we should not be surprised to see it given a trial in one of the larger ships. We refer to the use of a turbo-electric plant of the same general character as that which is giving such excellent service in stationary power houses ashore. As installed in the engine room of a large steamship the system would consist of steam turbines, direct-connected to electric generators, the current from which would operate motors directly coupled upon the propeller shafts. Although at the first blush this looks like a complication of parts, the advantages derived in the increased efficiency both of the turbines and the propellers, to say nothing of other gains, would under certain conditions render such a plant superior to the present direct turbine drive. This will be evident from the following considerations:

If the turbines on an ocean liner are run at the high speed of revolution which gives the best steam efficiency, this speed will be too great for the propellers. On the other hand, there is a certain maximum speed, beyond which propellers suitable to the propulsion of a large ship cannot be driven efficiently. From the horns of this dilemma the naval architect has sought escape by the only road open to him—that of compromise. Consequently, in the largest turbine-propelled ships of to-day, the turbines are too large and heavy and too slow, and the propellers are too small and running too fast to give their respective best results.

The conflicting requirements of the turbine and the propeller may be harmonized by the interposition between them of the electric generator. This can be done by using small, high-speed, steam turbines direct-connected to generators, these turbo-generators being run at the speed which gives the most economical results. From the generators, current would be led to motors, whose type and speed of revolution would be accommodated to the propellers on the outboard end of the respective shafts. It is evident that by this arrangement both at the steam end and the propeller end the designer would have a perfectly free hand, and in shape, size, speed, etc., he would be able to design directly for the work to be done and, therefore, for the highest efficiency results. Of course, in a plaint of this kind there would be a certain loss in the conversion from steam to electric power; but this has been reduced to such a low figure, that it would be more than offset by the increased efficiency of the turbines and propellers and by the great reduction in the sizes and weights of the turbines.

Incidentally there would be various valuable advantages secured. It would be possible, in the case of warships, to cruise at low speed economically, and it would be no longer necessary to provide separate cruising turbines. It would be possible to reverse immediately; and the go-astern turbines would, therefore, also be eliminated. Furthermore, the steam turbines could be located quite independently of the position of the propeller shafts, and might be carried on an upper deck immediately above the propeller-shaft motors. We understand that the problem, as we have outlined it above, has been receiving careful consideration from some of the manufacturers of turbine and electric plants. The only discouraging feature, in any proposed experimental work that might be done, is that a comparative test, to be of any value, must necessarily be carried on in an ocean-going ship of the larger size, since it is only in the larger ships that the reduction of turbine speed becomes a serious drawback.—*Scientific American.*

THE BRITISH SAILOR'S UNIFORM.—While there is much to welcome in connection with the alterations, modifications, and additions which have recently been promulgated in regard to the uniform of the seamen of the fleet, there is also room for some criticism. There has been a great deal of maudlin sentimentality sung and said about the sailor's uniform. As a matter of fact, it has not kept pace with the times, and men have been compelled to move about in ships, crowded with machinery in every corner, with "bell-bottomed" trousers and other loose-fitting garments, and with knife-lanyard festooned around their necks, at imminent danger to their lives.

Much of this will, happily, under the new *regime*, pass to the oblivion from which it has been too long preserved. Ready-made clothing will now be issued from every ship, and the sensible regimental Army system of having tailors, recruited from the fighting ranks, to alter stock sizes to fit the men, will be adopted. This is pure wisdom. But there lurks a danger in the wording of the circular letter which may largely neutralize its effect. It is hoped that by carrying tailors the number of sizes kept in stock may be reduced to a minimum. This is just what should be avoided. Clothes must be made to fit the men, for nature will not bend so much as the contractor's cutter. It should be the aim to alter clothes as little as possible, once they are fashioned in a certain mould. The tailors, in fact, should be employed only to make small alterations, and not large ones, to stock sizes, except in the case of outsizes. The argument of economy in storage space is unsound, as twenty garments of the same size take up as much room as twenty garments varying in size.

It is good to see a new and sensible overcoat introduced for sailors, which will finish well below the knee. A blue cloth overcoat of this description will look smart and be comfortable. All ratings may wear this overcoat without distinction, so the recenty expressed wish of the men in their "Magna Charta," to be clothed alike, and have their ratings marked only by distinctive badges, will be partly met. The men will also be allowed to wear brown canvas shoes, at the discretion of the captain, when actually on board ship. Both the overcoat and these canvas shoes will be optional, however, and the first will cost twenty-four shillings, while the latter will cost three shillings and sixpence only. Both of these innovations are for the good, as also is the free issue of cap ribbons to men when they change ships for the convenience of the Service.

One of the best of the changes goes in favor of the stokers, who are to have clogs provided and loaned to them for work in the stokehold, when under steam. The wooden soles will have high leather uppers, extending well up to the knee, which will afford them ample protection from live coals and hot cinders. The chief petty officer mechanics of the engine-room department will also be allowed to wear blue jean overhaul suits, which will be provided for them at a reasonable price, and all other working chief petty officers can have them if so inclined. All hands are to have a canvas jacket and a pair of canvas trousers, as a suit in which to perform all such work as coaling, painting, refitting, and other dirty jobs.

The first issue of clothing is to be a full gratuitous outfit, except in the case of boys and certain other classes of recruits who enter the navy on probation. These will not be fully kitted up at once, but they will eventually receive the same quantity of free clothing as the rest. Thus a free kit is practically secured to the men of the navy, though the cost of upkeep subsequently will still have to be borne from their pay. They contend in the "Magna Charta" that they should share the same privilege as the soldier and marine in regard to subsequent gratuitous issues after once being kitted up, but the authorities are not ready, apparently, to cover all this ground in one stride.

The new uniform regulations will, for the most part, begin to operate from April 1 of this year, with certain reservations in favor of the men, and they are to be in full swing by the first day of next year. The price

of the whole kit is reduced by about fifty shillings, and its upkeep will certainly cost less than has been the case in the past, as some of the most expensive compulsory articles, such as cloth trousers, have been altogether eliminated from the above date. Hats and caps will be lighter and better ventilated than the present pattern, and there will be a choice in regard to such things as socks and knives, two patterns of these articles being available.

Another alteration worthy of notice is the fact that in future the men will each have two hammocks and a waterproof kit-bag provided by the country, and these will be kept as personal property, but returned to the Crown on quitting the service; renewals will be made at the expense of the country, though losses and wilful damage will have to be paid for from the men's own pockets. The hammocks will be of a khaki color. They will be marked with the man's name, and will travel with him from ship to ship; and the hammocks will be of the seamless pattern.

Other loans to men while performing special duties for which their own compulsory kits are inadequate, or which exposes them to undue strain and wear, will in future consist of oilskin suits, sea-boots, watch-coats, and, as previously mentioned, clogs for stokehold wear. The oilskins and sea-boots will be for boats' crews and duty men, and the watch-coats for signalmen, look-out men, and other exposed night and day watch keepers. It is also, at last, recognized that sailors may have teeth worth preserving, and so a tooth-brush has been added to the kit, while black leather shoes and check shirts have been made optional.

Taking the effect of the change altogether, it is distinctly an alleviation of the financial strain which sailors have hitherto had to stand in regard to their clothing, and it should tend to considerably reduce the number of cases where men have previously got into serious trouble about their uniform. Compelled to take up contract-made articles and pay for them from their own pockets, the men have often been ordered to alter these garments the first time they were donned. Such a state of affairs could only be productive of much resentment on the part of the men, and punishment frequently followed. All the danger of future friction has not been entirely abolished, though it might well have been, but it is greatly minimized, and the sailor's uniform has been much modified and improved, and made to meet the new conditions which exist in the ships of the navy to-day. This is a great gain, and disarms captious critics, though it does not remove all cause for criticism.—*United Service Gazette.*

THE BATTLESHIP BATTLE.—The battle of the battleships still flourishes with undiminished vigor in naval circles, and the opposing schools are arguing strenuously for the class of fighting ship which they believe to be the best for all purposes. The two larger groups of controversialists range themselves on the side of the large and medium-sized battleship respectively. We see no reason to depart from the attitude we originally took up in favor of the medium-sized ship. We are not the less confirmed in this view by the fact that such high authorities on naval matters generally, as Captain Mahan of the United States Navy, and Lord Brassey, have now publicly ranged themselves on the side of the smaller ship.

We do not, of course, deny that under certain circumstances, such as a stand-up ding-dong fight with equal numbers on both sides, the commander of a *Dreadnought* squadron would have a great advantage over a squadron of smaller vessels only numerically equal to his own. But there are many other considerations to be weighed beside the fitness for such a moment in the ordinary life and work of a battleship. Accidents and chances, arising alike from the hand of God and the king's enemies, cannot be excluded from the reckoning when the pros and cons of the advantages of large battleships are being weighed. It is well known that a single chance shot, striking a ship in a vital spot, may altogether disable her or

cause her to temporarily withdraw from the fighting line to effect repairs, suppress a fire, or otherwise carry out work necessary to put her in trim to re-enter the fighting line. Such a thing is as likely to happen to a *Dreadnought* as a *Montagu;* a large battleship as a small one. Obviously the temporary loss of a *Dreadnought* to an admiral, in the middle of a battle, would be a very serious one, and might easily turn the tide of battle against him.

If the guns of a *Dreadnought* were mounted on two keels instead of one, a chance shot finding the mark would send the smaller vessel limping away from the action carrying only five 12-inch guns out of the fighting arena, instead of ten. This would not so heavily handicap the side to which the damaged ship belonged. It has to be remembered that it is no uncommon thing in these days for a ship to have to temporarily withdraw from the fighting line to effect repairs, and it is then that a *Dreadnought* would be so much missed, if five large ships were engaged, say with ten smaller ones, with the same aggregate tonnage and the same number of large guns as were carried by the *Dreadnought* squadron. And the "chance shot" is no mere figment, but an ever-present danger in a modern sea fight, when shot and shell will be falling like hailstones, in the middle of an engagement. Not all of these projectiles will do any vital damage, other than steadily reduce the fighting power of the ship, but one may eventually find the mark and cause a captain to take his ship out of action for temporary repairs. It is from such chances that, on the law of averages, the big-ship squadron would stand to suffer the most severely.

But in general calculations it is not the chance-shot theory alone that has to be considered, when the construction of such enormous battleships as those of 20,000 tons is being contemplated. Unfortunately, as we are too often reminded by a loss such as that of the *Montagu*, that the bottoms of our largest ships get penetrated by the points of jagged rocks, and a vessel costing the country more than a million sterling goes to pieces, within a hundred yards of our rock-bound shores, in a manner that the wit of man cannot guard against. The worst of it is that a ship costing the country that builds it two millions sterling, is no more immune from such disasters while controlled by fallible humans, than is a ship which cost only half that sum.

The same arguments are applicable in such cases as those in which a *Camperdown* sticks her stem into the thin bottom plates of a *Victoria,* and the latter ship founders in five minutes from the moment the blow is struck. The explosion of a mine under the bottom of a *Dreadnought* would probably cause a disaster as complete as those which sunk both Russian and Japanese battleships in and around Port Arthur; while an accidental explosion in a magazine. such as that which occurred on board the fine battleship of our neighbors at Toulon the other day, would wreck and destroy a *Dreadnought* as easily as an *Iéna,* and might even be more productive of loss of life among those trained as fighting men at great expense to the country.

There are other disasters known to men who go down to the sea in fighting ships which cause the destruction, in a single accident, of a large ship just as easily as of a small one. From this point of view, therefore, the spending of a sum, say, of £20,000,000 on naval fighting material, would appear to be better laid out on fifteen ships, carrying one hundred and twenty 12-inch guns, which is the most potent naval weapon of the moment, than in placing the same number of guns on ten keels only. We do not deny that there are other important considerations, but we are dealing with the matter chiefly from the points of view of gun-power and of speed. We are bound to confess that we attach more value to the development of gun-power (in a reasonably fast ship) than to the development of a singe extra knot of speed, at a considerable sacrifice either of armor or armament. We are not alone in this opinion in regard to speed and gun-power, but find ourselves in agreement with a large number of first-class

experts on ship construction and gunnery matters. In our opinion a given number of heavy guns is also better disposed, looked at purely from the tactical and strategical point of view, on a larger number of keels, so long as a reasonable and not a ridiculous proportion is maintained.

Speed tells nowadays not so much in tactics as in strategy, for given guns of equal range and power on both sides (and a determination to fight), speed simply enables the fastest fleet to fight on the outer circle, at a chosen distance. The slower ships would fight in the inner circle, and bring their guns to bear by a turn of the helm, and so economize coal and reserve the energies of the engine-room staffs for emergencies. Speed will certainly help a commander to refuse battle, but even its advocates do not press this point.

We have urged the necessity of equality of gun-power, for equal gun-power can be, and should be, associated with smaller ships. It is only when speedy ships have the longest range guns that their speed is of the maximum amount of use to them. Our contention is that smaller ships need not mean smaller guns, but only a smaller number of the largest caliber of gun carried over one keel. There is not the same economy in upkeep and manning, perhaps, in "the three instead of two" policy of battleship building, but neither is there the same loss occasioned by unforeseen and unexpected disaster in peace time, or by "chance" shots during a battle, and the policy of medium-sized battleships is therefore not to be dismissed so contemptuously as certain ardent advocates of the big battleship theory are apt to reject it. A country such as our own has many uses for battleships of the *Duncan* size, equipped with the heaviest guns, especially in view of the rapid naval development of Germany near the comparatively shallow waters of the North Sea.—*United Service Gazette.*

At the opening session of the annual meeting of the Institution of Naval Architects, Mr. James McKechnie, the engineering director of Vickers, Sons & Maxim, Ltd., submitted a paper on "The Influence of Machinery on the Gun Power of the Modern Battleship," in which he analyzed the design of machinery so far as it affected the fighting efficiency of the latest types of warships. He pointed to the necessity of reducing the weight of the propelling machinery, and illustrated this by showing that if the *Dreadnought* had only required a speed of 18½ knots instead of 21 knots, her engines and boilers might have been 700 tons lighter, sufficient to have permitted two more 12-inch guns and their ammunition to be carried. He advocated the adoption of a battleship whose power would be furnished by internal combustion engines using producer-gas generated on board, so that more space and buoyancy would be available for additional guns and ammunition. He further stated that after experiments extending over three years, his firm had perfected a definite plan for the construction of such a warship, the feature of which would be that it would have no funnels, no boilers, and would need a smaller crew. As there would be no funnels there would be no smoke, and the position of the ship would not be so easily betrayed as at present. The upper decks of the vessel would be left clear for the guns, which could be placed in the most desirable positions and fired in all directions.—*United Service Gazette.*

LIST OF PRIZE ESSAYS.

1879.

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880.

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881.

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882.

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. F. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883.

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CUILIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884.

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885.

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1886.

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1887.

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins,

1888.

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1891.

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1892.

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1894.

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1895.

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1897.

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1898.

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1903.

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1904.

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1905.

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NOTICE.

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its thirty-fourth year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII.

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fee to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army Revenue Marine, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

The Proceedings are published quarterly, and may be obtained by non-members upon application to the Secretary and Treasurer at Annapolis, Md. Inventors of articles connected with the naval profession will be afforded an opportunity of exhibiting and explaining their inventions. A description of such inventions as may be deemed by the Board of Control of use to the service will be published in the Proceedings.

Single copies of the Proceedings, $1.00. Back numbers and complete sets can be obtained by applying to the Secretary and Treasurer, Annapolis, Md.

Annual subscriptions for non-members, $3.50. Annual dues for members and associate members, $3.00. Life members fee, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md. and all checks, drafts, and money orders should be made payable to the same.

INDEX TO ADVERTISERS.

Name.	Manufacturers of or dealers in.	Post office address.	Page
A			
Ackw. Merrall & Condit Co.	Groceries, Wines, Perfumery and Cigars.	220 N. Charles St., Balto., Md.	13
B			
Babcock & Wilcox Co., The	Forged Steel Water Tube Marine Boilers.	Bayonne, New Jersey	24
Berwind-White Coal Mining Co.	Proprietors, Miners and Shippers of Coal.	No. 1 Broadway, New York, N. Y.	15
Bethlehem Steel Company	Guns, Gun Forgings, etc.	South Bethlehem, Penna.	7
Borden's Condensed Milk Co.	Condensed Milk and Evaporated Cream.	71 Hudson St., New York, N. Y.	28
Bruce & Co., Edward B.	Wine and Spirit Merchants.	Baltimore, Maryland	30
C			
Clay & Bock & Co., Henry.	Cigars and Cigarettes	Calle de Cuba Num. 37 Havana.	12
Colt's Patent Fire-Arms Mfg. Co.	Revolvers, Automatic Pistols, Machine Guns & Gatling Guns.	Hartford, Conn.	23
Continental Iron Works, The	Morison Suspension Furnaces.	West and Calyer Sts., N.Y., Borough of Brooklyn.	17
Cook's Sons, Adam	Makers of Albany Grease	313 West St., New York City.	31
D			
Dunlap & Co.	Hats and Silk Umbrellas	178 & 180 Fifth Ave., New York, N. Y.	13
Du Pont Co., E. I.	Du Pont Powder	Wilmington, Del.	16
E			
Electric Boat Co.	Submarine Torpedo Boats	11 Pine St., New York, N.Y.	22
F			
Forbes Co., W. D.	High-Speed, Engines, Blowers, Fans, Steering Engines, Electrical Generating Sets, etc.	Hoboken, New Jersey	14
Franklin-Hudson Pub. Co.	Publishers of Military Books	1014-16 Wyandotte Street, Kansas City, Missouri.	26
G			
General Electric Co.	Automatic Circuit Breakers	44 Broad Street, New York, N. Y.	18
Goubert Manufacturing Co., The	The Stratton Steam Separator	85 Liberty St., New York, N. Y.	25
H			
Hellberger, F. J.	Army and Navy Merchant Tailor.	535 15th St., Washington D. C.	19
Hoopes & Townsend Co.	Bolts, Cold Punched Nuts, Washers, etc.	P. O. Station S., Phila., Pa.	31
Horstmann Co., Wm. H.	Military Equipments	5th & Cherry Sts., Phila., Pa.	23
I			
International Powder and Chemical Co.	Powder.	Parlin, N. J.	14
K			
Keuffel & Esser Co.	Drawing Materials, Surveying and Nautical Instruments, Measuring Tapes.	127 Fulton St., New York.	21
Keystone Structural Co.	Structural Work for Building and Bridges in Iron and Steel.	Harrison Building, 15th and Market Sts., Phila., Penna.	..... .30

INDEX TO ADVERTISERS—*Continued.*

Name.	Manufacturers of or dealers in.	Post office address.	Page.
L			
Laflin & Rand Powder Co.	Smokeless Powder	New York City	14
Lake, J. H	Yachts, Launches and Supplies	Bourse Bldg, Philadelphia, Pa.	20
Lake Submarine Boat, The	The Lake Torpedo Boat Co	605 & 606 Colorado Bldg., Washington, D. C., U. S. A.	24
Leslie Company, The	Founders and Manufacturers	Lyndhurst, N. J., U. S. A.	20
Le Vavasseur, Alfred	Wines and Liqueurs	Bordeaux, France	20
Lidgerwood Mfg. Co	Hoisting Engines	96 Liberty St., New York, N. Y.	16
Lord Baltimore Press, The	Printers and Bookbinders	Greenmount Ave. and Oliver St., Baltimore, Md.	17
Lunkenheimer Co	Lunkenheimer Regrinding Valves	Cincinnati, Ohio	10
N			
Newport News Shipbuilding Co.	Ship Constructors	No. 1 Broadway, New York, N. Y.	7
Noel Construction Co	Builders	Baltimore, Md.	20
O			
Obermayer Co., S	Foundry Supplies	Cincinnati, Ohio	20
Orford Copper Co	Nickel for Nickel Steel	43 Exchange Place, New York, N. Y.	19
R			
Rice & Duval	Tailors	231 Broadway, New York, N. Y.	19
Roelker, H. B	The Allen Dense Air Ice Machine	41 Maiden Lane, New York	7
Rome Brass & Copper Co	Brass, Copper, Bronze, Yellow Metal.	Rome, N. Y	11
S			
Saunders' Sons, D	Pipe-Threading and Cutting Machines.	66 Atherton St., Yonkers, N. Y.	2
Schmidt Co., F. J	Navy and Army Tailors	Annapolis, Md	19
Schrader's Sons, Inc., A	Diving Apparatus	30-32 Rose St., New York, N. Y.	13
Sellers & Co., Wm., Incorporated.	Cranes and Modern Machine Tools.	1600 Hamilton St., Phila., Pa.	3
Shelby Steel Tube Co	Cold Drawn Seamless Boiler Tubes.	Frick Building, Pittsburg, Penna.	21
Speed & Co., James	Wine and Spirit Merchants	Gibraltar	24 p. of cover
T			
Taylor, Arthur N	Rigger	822 S. Delaware, Phila., Pa.	5
U			
Underwood Typewriter Co.	Underwood Typewriter	241 Broadway, New York, N. Y.	9
United States Metallic Packing Co.	Metallic Packings	Philadelphia, Pa.	18
W			
Watson & McDaniel Co	Steam Traps, Reducing Valves Separators and other Specialties.	146 N. 7th St., Phila., Penna.	5
Watson-Stillman Co	Hydraulic Tools and Machinery	25 Dey St. and 26 Cortlandt St., New York, N. Y.	3
Weston Electrical Instrument Co.	Electrical Instruments	Waverly Park, Newark, N. J.	17

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A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession, subject to the following rules:

1. The award for the prize shall be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1908. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the Proceedings of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the Proceedings of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writer of the first of them in order of merit will receive seventy-five dollars and a life-membership in the Institute.

6. Any essay not having received honorable mention, may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages of the Proceedings of the Institute.

8. All essays submitted must be either typewritten or copied in a clear and legible hand.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

PHILIP R. ALGER,
Professor, U. S. N., Secretary and Treasurer.

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CONTENTS

No. 123.

AIDS TO CONTENTMENT IN THE NAVY. By Rear-Admiral Caspar F. Goodrich, U. S. N. 905

PERMANENT COMPANY ORGANIZATION FOR THE UNITED STATES MARINE CORPS. By Captain H. L. Roosevelt, Assistant Quartermaster, U. S. M. C. 917

A LETTER FROM BENJAMIN FRANKLIN, TO DR. BROWNRIGG, RELATIVE TO THE USE OF OIL FOR STILLING THE WAVES 927

A SIMPLIFIED METHOD OF FINDING THE EQUATION OF EQUAL ALTITUDES. By G. W. Littlehales 937

A NOTE ON NAVIGATION. By Commander H. C. Gearing, U. S. N. 941

THE NEW NAVIGATION IN PRACTICE. By Lieut.-Comdr. T. P. Magruder, U. S. N. 947

NAVIGATING WITHOUT HORIZON. By Captain Bradley A. Fiske, U. S. N. 955

THE IDENTIFICATION OF STARS IN CLOUDY WEATHER. By Lieut.-Comdr. Armistead Rust, U. S. N. 959

THE FRENCH NAVAL MANŒUVRES OF 1907. Translated by P. R. Alger, U. S. N. 965

A BRIEF DESCRIPTION OF THE FUNCTIONS AND OPERATION OF AN EXPERIMENTAL MODEL BASIN. By Naval Constructor R. H. M. Robinson, U. S. N. 983

THE EROSION OF GUNS. By John F. Meigs 1001

ELECTRICAL INSTALLATIONS OF THE UNITED STATES NAVY. By Comdr. Burns T. Walling, U. S. N., and Julius Martin, E. E. 1005

DISCUSSION 1281

PROFESSIONAL NOTES. Prepared by Professor Philip R. Alger, U. S. N. 1289

Ships of War, Budgets, and Personnel.—Ordnance and Gunnery, Torpedoes.—Marine Turbines and Gas Engines.—Radio Telegraphy.—Miscellaneous.

BOOK NOTICES 1345

LIST OF PRIZE ESSAYS 1349

INDEX TO ADVERTISERS 1353

OFFICERS OF THE INSTITUTE 1355

SPECIAL NOTICE.—Naval Institute Prize Essay 1356

ADVERTISEMENTS.

No. 124.

AIDS TO CONTENTMENT. A Home for the Fleet. By Rear-Admiral Caspar F. Goodrich, U. S. N. 1357

THE VALUE OF SPEED IN TACTICS AND STRATEGY. By Lieut. A. C. Dewar, R. N. 1367

LIEUTENANT DEWAR'S PAPERS ON "SPEED IN NAVAL TACTICS" AND "SPEED IN BATTLESHIP STRATEGY." By Commander A. P. Niblack, U. S. N. 1385

No. 124.—*Continued.*

THE COURT-MARTIAL OF COMMODORE DAVID PORTER. By Lieut.-Commander Edward L. Beach, U. S. N. 1391

THE REALITIES OF BATTLE: WEAKNESSES, HEROISMS, PANICS. By General Daudignac, of the French Army. Translated by Lieut.-Col. W. W. Gilbert, U. S. A. 1403

NAVAL ADMINISTRATION, 1842-1846. By Chas. Oscar Paullin. 1435

TORPEDO AND MINE EFFECTS IN THE RUSSO-JAPANESE WAR. Translated by Philip R. Alger, Professor, U. S. N. 1479

A "USEFUL TABLE" FOR TACTICAL EVOLUTIONS AND FOR OTHER PURPOSES. By Lieut.-Comdr. Geo. Wood Logan, U. S. N. 1487

STAR-FINDING DIAGRAM. By Lieut.-Comdr. Armistead Rust, U. S. N. 1491

SOME REMARKS ON REAR-ADMIRAL GOODRICH'S ARTICLE, "AIDS TO CONTENTMENT IN THE NAVY." By Lieut.-Comdr. A. B. Hoff, U. S. N. 1493

THE ANNUAL MEETING OF THE INSTITUTE 1501

DISCUSSION 1509

PROFESSIONAL NOTES. Prepared by Prof. Philip R. Alger, U. S. N. 1511
Ships of War, Budgets, and Personnel.—Ordnance and Gunnery, Torpedoes.—Marine Turbines and Gas Engines.—Radio Telegraphy.—Miscellaneous.—Practical Steam Engineering. Compiled by Lieut. Paul Foley, U. S. N.

BOOK NOTICE 1583

LIST OF PRIZE ESSAYS 1584

OFFICERS OF THE INSTITUTE 1589

SPECIAL NOTICE.—Naval Institute Prize Essay, 1908 1590

ADVERTISEMENTS.